THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1368.] LONDON, JULY 30, 1889. [41ST YEAR. Price 6d.

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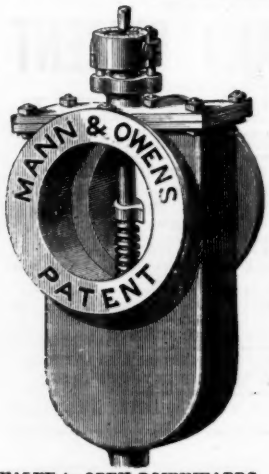

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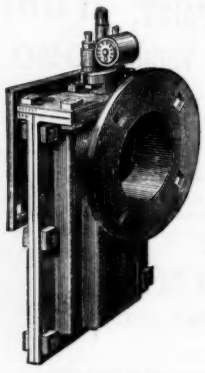

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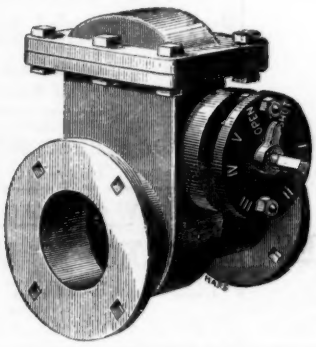

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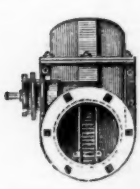

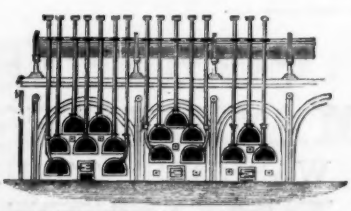

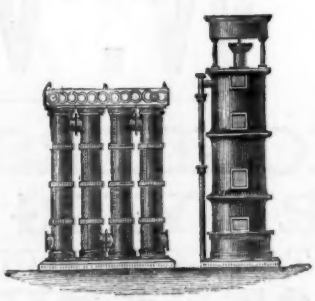

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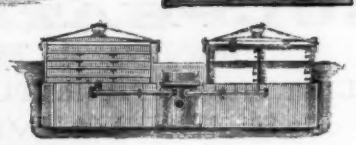

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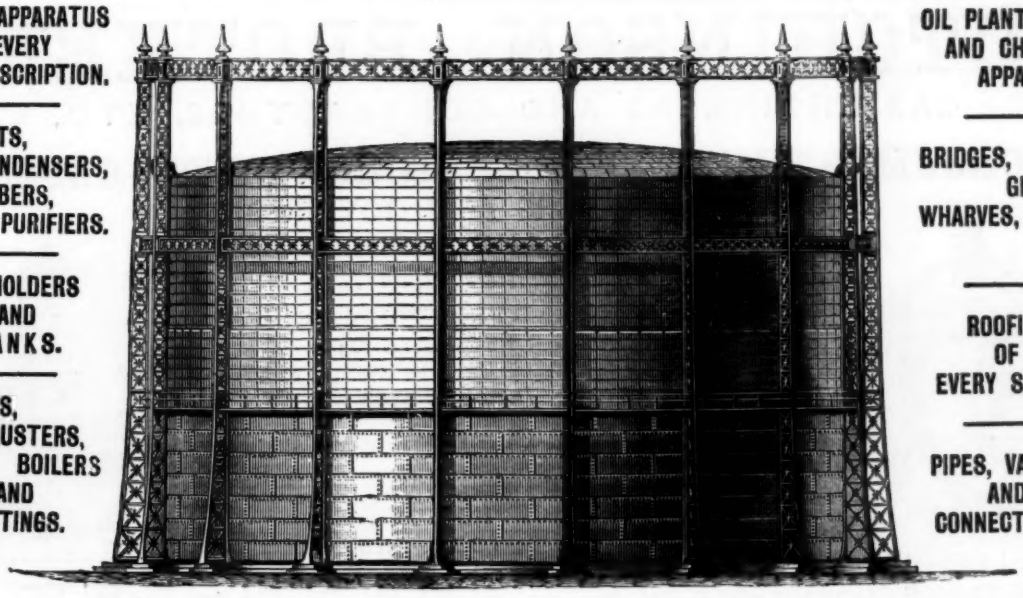

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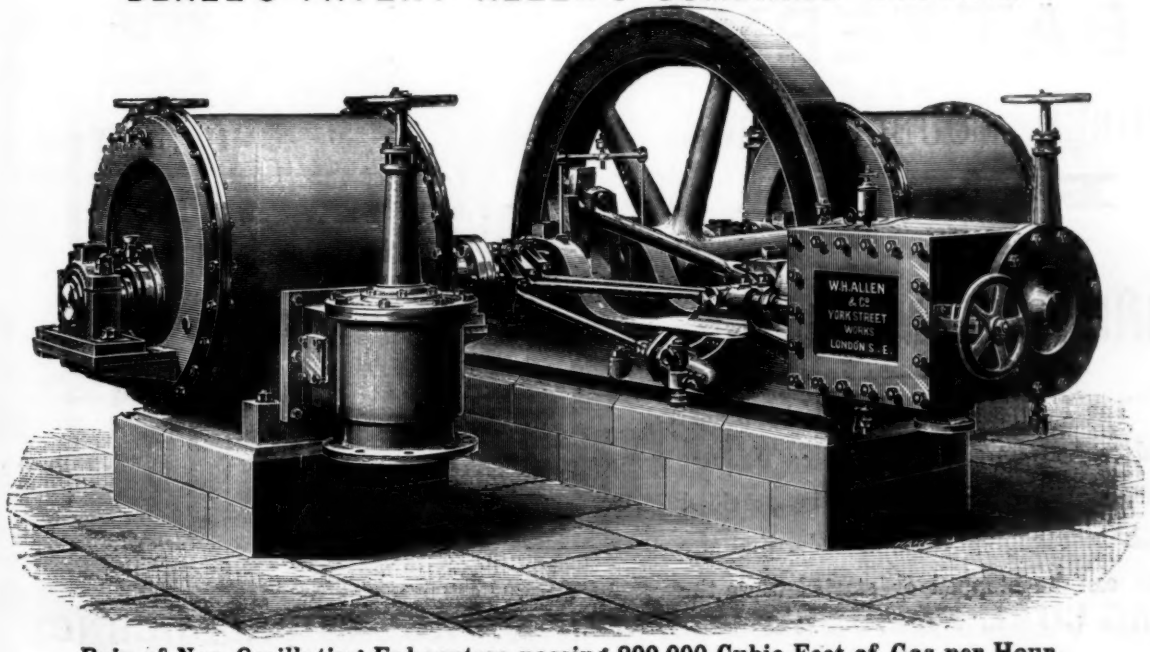

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MOST EFFECTIVELY AND *ECONOMICALLY RESTORES* LIME WASTES CONTINUOUSLY.

The Patentee having under his several Patents effected a complete solution of the Spent Lime difficulty, most confidently solicits the consideration of the fact by the Engineers and Managers of Gas Companies, Gas Corporations, and other Spent Lime producers. The adoption of these Patents secures the following amongst other advantages, viz.:—1st. Nuisance is avoided, and the utmost convenience and comfort in Gas purification are secured. 2nd. The Lime is recovered at from one-third to one-half the cost of new Lime, or from 5s. 6d. to 7s. 6d. per Ton (depending on extent of works and working charges). 3rd. The Lime is either recovered for Building and Agricultural purposes, or specially and continuously for Gas purification—no limit being assigned to its durability. 4th. Nearly the whole of the valuable sulphur is collected and sold. 5th. By the Patentee's Improved Furnace, breeze or inferior cannel coke only is required as a fuel. The process has been worked for a considerable time by several important Gas Companies and Corporations throughout the Kingdom, and with the most satisfactory results. The Patentee erects, proves, and grants working on very moderate terms.

Further particulars may be had on application to A. F. Wilson, Esq., Assoc. M. Inst. C.E., 12, Walbrook, London, E.C., Agent for London; J. E. Fisher, Esq., Stourbridge, Agent for the rest of England, Wales, and Ireland; or to the Patentee—

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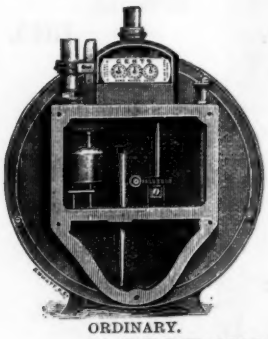

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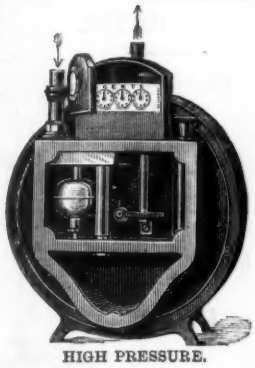

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Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

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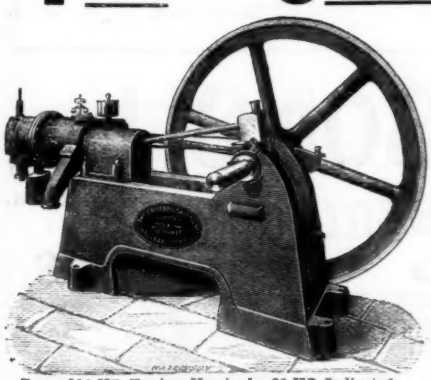
GREAT SUCCESS.



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which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

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FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

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SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

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Lamps giving 20-Candle power consume less than four feet of Gas per hour.

A PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

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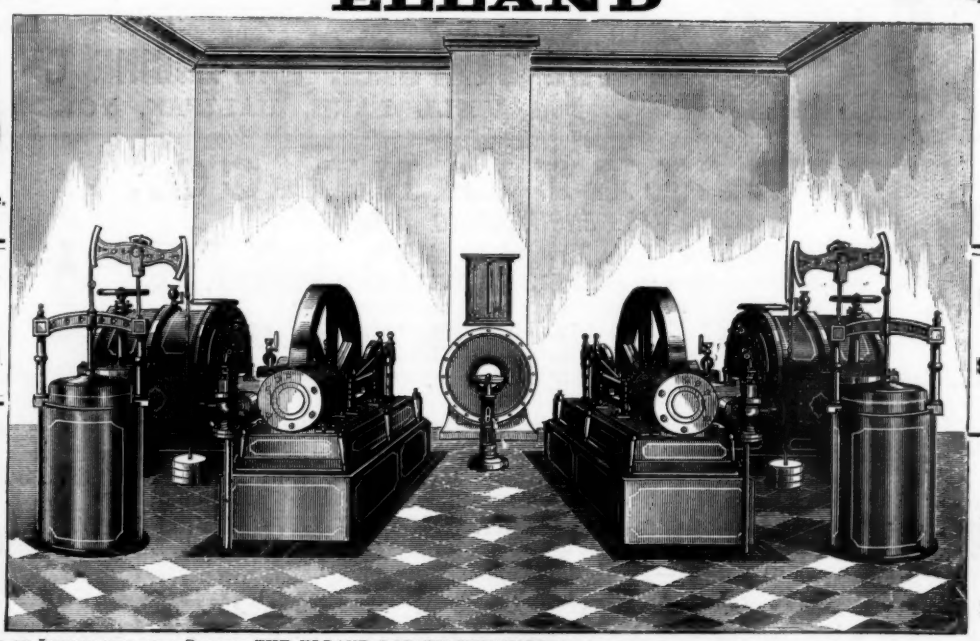
No. 1. Flange Valve.

NO SLIP.

NO OSCILLATION

No. 3. Screw Valve.



No. 5. Screw Valve.

NO HIGH SPEED.

STEADY GAUGE.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

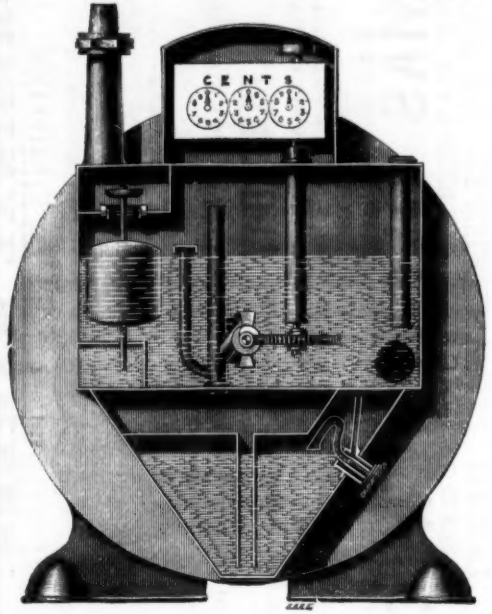
Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

DEMPSTERS', ELLAND.

THE SYPHON OVERFLOW

— Wm. Cowan's Patent. —



To suppose, as some do, that the main object of the "Syphon Overflow" is to promote the convenience of inspectors and others who "water" meters, is to misapprehend the chief purpose of the invention. That the convenience of inspectors is promoted by the Syphon Overflow is a fact that admits of no doubt whatever, because the watering of meters is thereby greatly facilitated; but it is a mistake to fix attention upon this result, and to regard it as the only one attained. To do this is to lose sight of the chief purposes the Syphon Overflow was designed to secure.

These purposes were—

1st.—The **speedy** attainment of **exactly the same water line** on each occasion of watering.

2nd.—The **absolute certainty** of this water line being attained.

3rd.—The **impossibility** of any water afterwards finding its way into the waste-box.

The first and second of these conditions secure the interests of the gas company, whilst the third greatly promotes the convenience of the consumer, for reasons that are well known.

Who that has had experience of Wet Meters does not know the disadvantages of the "Low Spout?" The slowness with which it adjusts the water line, and the patience required while this is being done, are matters of every-day experience. It is therefore no wonder that the "Syphon Overflow" is regarded as one of the most important improvements ever made in the Wet Gas-Meter. It is not only an important improvement **in itself,** but it possesses the property of making all previous improvements more valuable and effective. It has, indeed, made the Wet Meter a more perfect, and, in every way, a more satisfactory instrument.

Narrow views as to price often prevent the adoption of real improvements; but it would be a narrow view indeed which would prefer a "Low Spouted" Meter to one with a "Syphon Overflow," because of the trifling difference in the price of the two.

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ESTABLISHED 1827

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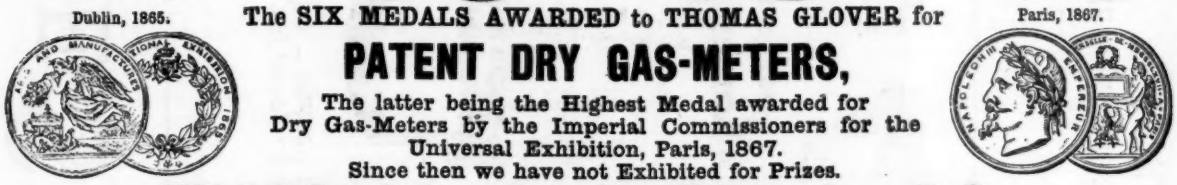
London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

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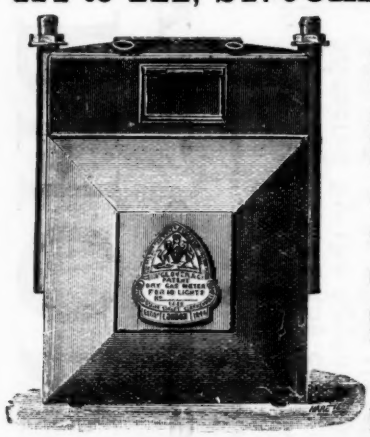
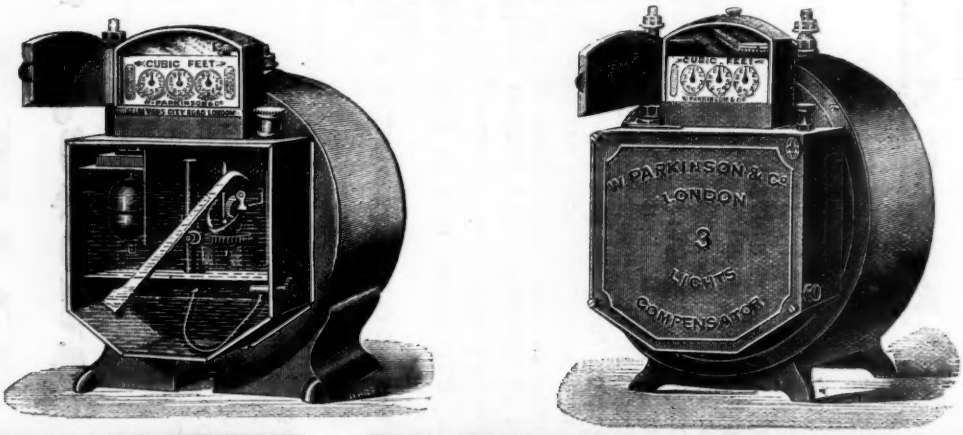


1st—Are a remedy for all the defects of Wet Meters
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by frost, however severe.
5th—Are the most accurate & unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.

Meters fitted with Grey's Index or Harding's Counter.

W. PARKINSON & Co.



WET METERS

IN TINPLATE OR CAST-IRON CASES

COMBINE THE FOLLOWING IMPORTANT IMPROVEMENTS:—

Parkinson's Patent Three-Partition Measuring Drum { *Ensures perfect accuracy of measurement with the least possible friction, works with the greatest ease, and is free from complication of any kind.*

Slow-Spoon Compensator { *Maintains an unvarying Water-line without any appreciable friction, and provides a large reserve of Water. Has stood the test of Time.*

Enclosed Float { *Allows sudden or excessive pressure on the Inlet without affecting the working of the Meter, or extinguishing the Lights.*

COTTAGE LANE WORKS, CITY ROAD, LONDON. *Telegraphic Address:* "INDEX LONDON."

[See also Advt., p. 236.

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NOTICE TO SUBSCRIBERS
AS TO PAYMENT OF SUBSCRIPTIONS IN ADVANCE.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 30, 1889.

MR. G. R. HISLOP'S ADDRESS TO THE NORTH BRITISH GAS MANAGERS.

THE North British Association of Gas Managers held their twenty-eighth annual general meeting at Dunfermline on Thursday last, under the presidency of Mr. George R. Hislop, of Paisley. There was a good attendance of members, although the attractions of the meeting were gravely discounted by the bad weather—more like late March than middle July—which came in for the whole of the kingdom with the feast of St. Swithin, and did not spare the historic and not very accessible locality where the Scottish gas managers foregathered this year. There is not very much to be said about the work of the Committees of the Association, whose reports were duly presented. The progress of the local branch of the search after gas purification in closed vessels has apparently experienced a check, through the request of Mr. W. Young for the postponement of the work of the Committee who were charged with the investigation of this matter. The Murdoch Memorial Sub-Committee reported that the fund in their custody has attained the respectable amount of £301, and they very sensibly asked the members of the Association for suggestions as to the form which the memorial should take. Mention was made of a bursary, a scholarship, a medal, a monument, or a tablet in Westminster Abbey. It appears to us that quite enough money has been collected for the purpose of perpetuating the name of Murdoch, and that the application of the fund may well constitute one of the principal cares of the Association at the meeting next year. In the meantime, the form of the memorial may profitably be thought over and discussed in public, if sufficient interest can be aroused in the subject. With this view, we suggest that the Sub-Committee should agree among themselves, if possible, upon the form of the recommendation which they will have to make to the Association, and make it known sufficiently early for any counter-suggestions to be published and considered before the meeting. Then, after the meeting has decided upon the course to be adopted, it would not be a bad plan to defer final action for another year, and obtain a confirmation of the resolution at the second meeting. There is no need for hurry in a matter of this kind; and it is infinitely preferable to deliberate sufficiently beforehand, than to criticize or repent when it is too late. The members of the North British Association deserve credit for their success in bringing up the fund to a respectable amount; and it is to be hoped that their wisdom may be equally prominent in connection with the disposal of the money.

Mr. Hislop's Inaugural Address will be found in full elsewhere. It is not a lengthy composition; but the reputation of the author as a shrewd, original-minded Engineer will not suffer from what is said in it. It is, indeed, a very worthy contribution to the literature of contemporary gas engineering; containing several practical hints likely to be of value to gas manufacturers everywhere. Some of Mr. Hislop's remarks refer chiefly to the conditions of gas making prevailing in North Britain; and rightly so, for every localized society of gas engineers expects to see its local character mirrored in the remarks of its official spokesman for the time being. It cannot be truthfully alleged of Mr. Hislop, however, that he keeps for "brither Scots" alone what was meant for mankind—his own judgment and the fruits of his experience. The address begins with a cursory reference to the condition of The Gas Institute, which all good Scotsmen look upon as the eldest child of the North British Association. Mr. Hislop's words upon this subject have a distinct savour of the sort of comment made by easy-going parents when somebody remarks that a married son or daughter, as the case may be, is not quite comfortable. They hope matters will come all right in time, and meanwhile do not greatly agitate themselves about such a little thing as a disagreement in somebody else's household. It is a pity, of course; but such things will happen sometimes, and so the least said the better. There is a good deal of practical wisdom in this apparent carelessness; for if all acted in the same spirit, there would be no meddlers to make disagreements ten times more painful than they would be if left to the parties concerned.

The address very sensibly omits all merely retrospective matter, such as too often constitutes the "padding" of compositions of the kind. It is a grievance that we hear often complained of, when a President keeps his hearers mainly listening to platitudes respecting technical matters that all have read about in the professional journals, where the work of chronicling the progress of the industry is, as a rule, much better done. Mr. Hislop clearly understood that his colleagues, in putting him into the presidential chair, wanted to hear his own opinions concerning points of *technique* in which he happens to be most interested, and not to have from him an account of what other people had done, respecting which he could probably not tell them anything more than they could find out for themselves. The first subject dealt with by Mr. Hislop in this way was the effect of water in coal carbonized for gas making. Unfortunately, he had not had time to complete some researches which he is understood to have begun with regard to this matter, and therefore he could say but little about it; but it may be hoped that the deprivation of the profession in this respect is only temporary, and that Mr. Hislop will find an opportunity in the near future for doing what he was prevented from accomplishing on Thursday last. The next technical topic touched upon by the President was the necessity of high heats for carbonizing the rich coals from which gas is chiefly

made in Scotland. This is a truth that for a long time escaped the observation of many carbonizers of cannel, who were misled by the facility with which a rich gas can be obtained with a low heat from this class of material. The effect of high heat, in fixing or rendering permanent some of the vapours which are condensable from cannel gas produced at a low heat has, however, forced its way upon general recognition; and to-day it may be said that in no part of the world is the high and regular heating effect obtainable from gas generator furnaces better appreciated than it is in North Britain.

Still, although high heats do a great deal for rich coals, Mr. Hislop confesses that careful treatment of the gas in the works is desirable, if trouble and loss are not to be experienced through the precipitation of condensable hydrocarbons. At this point he unites the interest of Northern and Southern gas managers by combining in one purview the fluid condensation troubles of the former with the naphthalene, or solid condensation, griefs of the latter. "What we in the "North lose as liquid hydrocarbons in the syphons," he seems to say, "you in the South find blocking up your mains "and services in the shape of naphthalene." It is not the same thing, of course, but the vexation is equal in both cases; and the remedy may be the same, as the two plagues stand in such close relationship to each other. This remedy, as Mr. Hislop puts it, is simply to keep the gas at a temperature between 55° and 62° at the outlet of the condensing and scrubbing plant. If necessary, this is to be effected by the use of a steam-jacket at a suitable point of the connections. If this suggestion is not wholly novel, it is at least interesting, and quite sufficient in itself to redeem a presidential address from all charge of barrenness. It is to be hoped that the validity of Mr. Hislop's counsel may be tested by direct experiment. There can be no doubt that temperature in condensation has a great deal to do with naphthalene troubles. These, if we do not err, are liable to cause most annoyance in winter in the works and in summer in the district. There may be many exceptions to this generalization; but it is tolerably well agreed among gas managers troubled with naphthalene at home and abroad that it may be found in the services in the height of summer, and, indeed, that sudden changes of temperature seem to influence its deposition even more than heat and cold *per se*. It remains to be proved that any possible regulation of pipe temperature in the works will completely prevent the precipitation of naphthalene outside; but there is no doubt that proper treatment of the foul gas has a great effect upon the behaviour of the purified gas in this respect. Condensing and scrubbing, and even purifying plant, is subjected to such diverse influences of position, aspect, &c., in different works, that there is plenty of scope for the operation of those causes which Mr. Hislop regards as contributing to the precipitation of liquid and solid hydrocarbons in the mains; and there should be no difficulty in the application of his remedy.

In speaking of the oxygen process of gas purification with the aid of lime, it appears to us that Mr. Hislop was under a misapprehension. He remarked that "where lime is used "in conjuction (with oxide) the whole of the sulphur may be "completely discharged therefrom, and sent forward to the "last or oxide purifiers, and thus secure a pure carbonate "of lime absolutely free from smell, capable of being re-"covered *ad infinitum*, while the entire sulphur will be "saved." Now, it has been understood as a feature of the oxygen, in common with the air process, that the sulphur, so far from being driven forward, is fixed in the native state in the lime itself; so that the spent lime is not a pure carbonate, but a carbonate containing about 20 per cent. of free sulphur. The material cannot, therefore, be revivified by any process for driving off the carbonic acid, without account being taken of the accompanying sulphur. Perhaps Mr. Hislop will be able to make further inquiry into this matter. He made a good point concerning the superior advantage of passing gas down through lime instead of in the reverse direction, as is more general. The only other suggestion by Mr. Hislop was with regard to improving the process of charging gasholders with gas for the first time. Altogether, the address will repay attentive perusal, whether or not one wholly agrees with its author.

THE COUNTY COUNCIL ON TESTING LONDON GAS.

The London County Council, at their ordinary meeting last Tuesday, received an important report from the Sanitary and Special Purposes Committee respecting gas photometry. A reference was some time since made to the Committee with regard to the legalization of tests made with the portable photometer; but in connection with this subject they also considered the cognate questions of an improved standard of light, and the settlement of a standard form of photometer. Accordingly, they have addressed to the Secretary of the Board of Trade a letter, now confirmed by the Council, requesting him to draw the attention of the Department to these matters, and reciting the present situation of the Gas Referees, the Council, and the Gas Companies, in connection therewith. The Committee are able to state that there is substantial agreement between them and the Gas Companies as to the desirability of prescribing a standard form of photometer; there being at present at least four different models of such instrument in use in London, all giving divergent results. As to the substitution of something better in place of the standard candle, however, and the legalization of the portable photometer, there is no pretence of agreement. The Council think they have found a reliable substitute in pentane, although it is not specified by name; and the Referees believe the indications of the portable photometer to be as trustworthy as those made in the existing testing-places. But this is not saying very much, and it is left to be inferred that the Gas Companies are not in accord with the other parties to these questions; which is notoriously the fact. The Board of Trade are asked to take the necessary steps for moving Parliament in this matter next session; but we know they have already declined to stir in the indicated direction unless preliminary agreement between all parties can be assured, and it remains to be seen whether they will reconsider their attitude in consequence of this communication from the County Council. The only agreement that can be recognized at present on the subject is that photometry, as applied in the legal manner to the testing of gas supplied to London, is of little or no use except to cause friction and annoyance all round. Whether the proposals of the County Council supply the best or only cure for the admitted evil is another question, which they appear somewhat too much inclined to regard as one for them to settle with scant reference to the other interests concerned.

THE AFFAIRS OF THE WATER GAS COMPANIES.

The British Water Gas Syndicate appear to be getting into deep waters. The concessionary companies have not yet parted with the money which they agreed to pay for their licences; and it is apparently not their intention to do so until they are better satisfied than they are at present respecting the value of the property which they are supposed to buy. In the City there is no secret made of the fact that the water gas speculation has collapsed; and some piquant revelations respecting the ways and methods of the promoters are threatened. The whole thing is practically in abeyance for the present. No work is being done or attempted; and it is more than probable that all the companies originating in Mr. Samson Fox's great "boom" will be wound up without anything more being heard of them. Some people have made a good lot of money by dealing in the shares, principally of the parent Syndicate, with gamblers like themselves; and with this they will have to be content. It has been a short "flutter," but a merry one for those on the right side. As we have all along declared, the speculation has been nothing more than a gamble, and any other counters besides water gas shares would have answered the turn equally well if people could have been induced to take the same interest in them. The season which is now running to its close has been fruitful in this class of ventures. The gambling spirit has been very active; but it ought to become a subject for the consideration of the Legislature whether means cannot be found for preventing this sort of thing for the future. It is undeniably a great public evil, for it brings joint-stock enterprise into discredit, and hinders the real work that the limited liability system of trading is calculated to perform. Flashy projects receive a temporary support, while genuine ventures, only requiring money for floating them, are neglected. Even the most deserving undertakings fall under the influence of the "promoter," and when successful in obtaining capital, have to pay an exorbitant price for it. The corruption of what was initially intended as a boon to the trading community is a mournful illustration of the difficulty that attends any novel departure from established business methods, and of the ever-present risk of measures meant for the cure of recognized evils. The old principle of unlimited partnership had many deplorable consequences, but no thoughtful man can regard the state of what is called "the City" to-day

without feeling that if the spectre of the future Promoter had appeared before the framers of the first Limited Liability Acts, they would have shrunk appalled from the monster whom, unconscious Frankensteins as they were, they were then creating—or at least providing for, which is almost the same thing.

REBATE ON COAL-CARRIAGE CHARGES.

The united action of Gas Companies and Corporations against the possible deprivation, under the Railway and Canal Traffic Act, 1888, of their customary rebate on the carriage of gas coals, culminated on Thursday last in a most influential gathering at the Birmingham Corporation Gas Offices, at which practical measures calculated to make the protest effective were concerted and put in operation. Although the notice convening the meeting was of the shortest, a thoroughly representative assembly was secured, and the names of the delegates, which will be found in our report of the proceedings in another column, may be taken as a guarantee that the work so energetically begun by Mr. Deakes, of Worcester, will now be carried through to the end. Money has also been forthcoming; and no time will be lost in pushing the question forward to its legal issue before the Railway Commissioners. A beginning has been made by the South Yorkshire and North Derbyshire coal owners, in the form of a friendly action to determine the matter of "undue preference" in connection with gas coal traffic; but this does not exhaust the question—being, indeed only one division of it. The imminence of the Long Vacation will prevent anything being settled for three months; and, in view of this circumstance, it has been decided by the Committee formed last Thursday to call another meeting after this suspension of legal activity, when it is thought that the number of gas undertakings joining in the movement will be increased. The Committee can then be strengthened, and future proceedings determined upon. All communications on the subject are meanwhile requested to be sent to Mr. Edwin Smith, at the City Gas Offices, Birmingham. Although Mr. Deakes for the time drops out of the leading position which he assumed in the public service, and through pressure of circumstances, at a time when nobody else appeared to be alive to the necessity for action in the defence of the gas interest, it must not be forgotten that the credit of success thus far belongs to him; and we cannot conclude this mention of Thursday's transactions without congratulating him upon the testimony they afford to the value of his initiative in the cause.

IS RUSSIAN PETROLEUM FAILING?

An extraordinary piece of news from Baku was published in the newspapers last week, to the effect that the supply of petroleum at that centre of the Russian mineral oil trade is showing signs of exhaustion. It is, of course, impossible to tell at present how much truth there may be in the rumour, but if it is reliable, it is not too much to say that it puts a new face upon the prospects of the mineral oil industry of the world. It has been accepted without question, after the many reports that have been received on the subject, that the oil basin of this region is practically inexhaustible. Although containing a large proportion of heavy, or fuel and lubricating oils, Russian petroleum has had a powerful influence in keeping down the value of American and other burning mineral oils and spirits, and has been looked upon as a guarantee that the cost of this resource of modern civilization would never rise to any noteworthy extent, even if it was not diminished, within a time that need be comprised within the forecasts of practical men. Russian oil was to be the principal agent in spreading civilization through Central Asia, and was to keep the whole Eastern Hemisphere in light and fuel for undefined ages in the future, whatever might become of the American fields of production. Is all this prospect to be shattered? Are all those great spouting wells of which we have read as forming veritable lakes of crude oil in their vicinity, mere temporary ebullitions of a pent-up store which once tapped will never be refilled? It has been stated definitely that the agent of the Rothschilds, who are known to be largely interested in the Russian oil business, has been summoned to Paris to report to his principals on the situation; and the Nobels are also stated to have been compelled to go afield for supplies for their refineries. It is, of course, premature to speculate too much upon the immediate consequences of what may turn out after all to be an exaggerated and unfounded alarm; but if there is nothing in the report, it is strange that it should have gained currency in such a prominent fashion. A short lapse of time will show by the course of the market quotations whether experts discredit or accept the warning conveyed by the newspapers.

Water and Sanitary Affairs.

Last Wednesday, a Parliamentary Return, moved for above twelve months since by Mr. J. F. B. Firth, relative to the Metropolitan Water Companies, was issued; being in continuation of a similar document published four years ago, except that the former covered a longer period than the present one. The first return begins in 1872, and ends in 1883; while the second begins in 1883, and ends with 1887, or in some cases with March, 1888. We have thus a review of the situation from 1872 down to the close of 1887, or a little later. Both returns exhibit the somewhat remarkable feature of a value put on the share and loan capital of the Companies according to an estimate made by the Committee of the Stock Exchange. Some particulars taken from the later return will be found in another column; and attention is naturally drawn to the fact that the average water-rental per house has fallen by more than 2 per cent., whereas the return which ranged from 1872 to 1883 showed a rise of nearly 20 per cent. Over the entire period, dividends steadily rose in almost every case, although some have fallen, and only two have considerably risen since 1883. So also while the value of the share and loan capital of the Companies continues to rise more rapidly than the actual amount of the capital, the increase is not so marked now as on the former occasion. Between 1872 and 1883, the share capital underwent an advance of 30 per cent.; but the value went up by rather more than 100 per cent. In the later period, the capital has undergone an increase of 3·8 per cent.; and the value has risen 5·6 per cent. Of course, had the rise during the four years been at the same rate as in the twelve, the value would have gone up by more than 12 per cent, instead of less than 6 per cent. This shows, in fact, that the rate of increase had fallen off so as to become less than half what it had been. Still there is progress; and the general results would have been better, but for a decreasing value in the share capital of the New River and Southwark and Vauxhall Companies. The variations among the Companies since 1883 is great; the share capital of the Lambeth showing an increased value of 33·8 per cent., while the actual addition was only 5·4 per cent. The Chelsea capital was augmented by 3 per cent., and rose 25·4 per cent. The share capital of the West Middlesex Company was augmented by the merest fraction; but underwent an increase of 4·3 per cent. in value. On the whole, a share capital of £10,805,383 appears at the close of 1887 as possessing a value of £26,131,570. In the case of the loan capital there is an increase of 14·4 per cent., and a rise in value of 23·3 per cent., comparing with an increase of 18·8 per cent. in amount, and 42·3 per cent. in value, in the earlier period. The final amount of loan capital is £3,160,475, which has a value of £3,803,250. Altogether, in round numbers, we have share and loan capital to the extent of £14,000,000, having a market value of £30,000,000. As affecting the progress of the London Water Companies since 1883, we have to bear in mind the reduction in the basis of the water-rental consequent on the decision of the House of Lords in the Dobbs case in that year, followed by the Water-Rate Definition Act in 1885. Whatever use may be made of the figures in these returns, if fairly handled they fail to show that the London Water Companies are otherwise than prospering, although their prosperity may not be growing so fast as in some preceding years. It is true that the houses and other buildings supplied with water were 10·6 per cent. more in number in 1887 than in 1883; while the increase in the water-rental was only 8·2 per cent. Yet it will be found, on examination, that each pound of share capital was worth more in 1887 than in 1883. How matters have progressed will be seen by working out a few figures in these returns. Thus in 1872 each pound of share capital was equal to £1·55 pound of estimated value. In 1883 this became £2·377; and in 1887, £2·417. Despite some fluctuation and a few exceptions, the general result serves to prove that the price set forth as the value of the undertakings in the Government Purchase Bill of 1880 was simply a fair equivalent for a growing interest. If any parties wish to buy this valuable property, of course they will have to pay for it. The Companies took the risk at the outset; and they certainly have a right to their statutory profits.

All our daily contemporaries, diametrically opposed to each other though they are on almost every other topic, have a fling, in turn, at the Metropolitan Water Companies. To-day it is *The Times;* to-morrow, the *Standard;* then, perhaps, the

Daily News. Each and all of these estimable journals, when "copy" is scarce, bethink them of the convenience and safety of "throwing mud" at the undertakings coveted by the County Council. We have grown used to this kind of thing, and therefore to ourselves it will occasion no surprise if, as the "silly season" advances, the Metropolitan Press should hark back to the imaginary greed and wickedness of the eight London Water Companies. Already the *Star*—that orb of "sweetness and light," which shines forth for the guidance of the million—is going into raptures over the programme of Professor Stuart. The Professor tells the "*Star* man," and the "*Star* man" tells the London ratepayer, that the passing of the proposed financial measures will cause a saving of 11d. in the pound. "How do you "make that out?" inquired the *Star* reporter; and straightway the worthy Professor proceeded to dissipate his doubts and fears—mentioning incidentally that 4d. in the pound is to be saved by buying up the undertakings of the Water Companies. Half of this saving, the Professor and his friends "calculate," is to be effected in the expenses of management. There may be some people who will think an estimated saving of £500,000 a year under this head alone a little too good to be probable. The other half million, which the sanguine Professor sees his way to lay hands upon, is to be obtained in a different manner. The present dividends, he contends, come ultimately out of the householders' pockets; and the steady rate of interest which is hereafter to be ushered in will leave a margin of £500,000, equal to a reduction of 2d. in the pound in the Metropolitan rate. There you have the whole thing—so simple, so soothing, so certain—in a single paragraph of the *Star!* It seems almost presumptuous to offer, or anticipate, any criticism of Professor Stuart's estimates and calculations; and yet we can hardly doubt that when the Bill from which it is desired to evolve the "London "Water-Works Purchase Act, 1889," is discussed in Parliament some daring spirits may venture to question the figures and repudiate the conclusions which we have cited. Alas! that prophecy and paper calculations should so often be nullified by the results of actual experience. The measure itself looks quite as plain and simple as the Professor's estimates. The London County Council, says the Bill, shall be empowered to purchase, and the Companies, or any of them, to sell a part or the whole of their undertakings. Then come the borrowing powers. Then the provisions as to application of revenue. First, of course, the expenses of management and maintenance of works are to be provided for; and it is here that the authors of the Bill fancy they see their way to wholesale retrenchment and reform. In the meantime, however, it is proposed to enact that every servant and officer attached to the selling Company is to occupy a like position under the County Council. This means, no doubt, that that august body will make use of these experienced officials to teach them their business, and then, at a convenient season, dispense with their services or cut down their salaries. The justice and high morality of this programme must be at once apparent. Having paid the working expenses, attention is to be given to the sinking fund, so that the new stock may be redeemed within the term of sixty years, and the current surplus (if any) is to be applied in reducing the water-rates. Such is the purchase scheme, cut and dried. It involves, or presumes, many things; and amongst them, the existence in the ratepayer's breast of a profound faith in the administrative abilities and the public spirit of the county councillor. Yet, curiously enough, at this very time, when it is desired to impose so huge a trust on the successors of the Metropolitan Board of Works, the conviction is deepening and broadening that the new representatives of the ratepaying community are not so very brilliant, capable, and trustworthy after all. Hope and confidence are giving place to sentiments of doubt and incipient disgust. The *Morning Post*, we notice, has raised a bitter cry of disappointment. Londoners are warned by our contemporary that the leopard cannot change its spots; in other words, the Board of Works member and the County Council member are made of much the same material, and that, furthermore, it is not to be expected that "nonentities," when vested with a certain amount of authority, will put aside their crotchets, and govern their conduct by a proper sense of responsibility. The London County Council, as at present constituted, is contemptuously compared, by the journal we have quoted, to a young men's debating society. Its business capacity is scouted, and its methods condemned. And yet this is the body to which Professor Stuart and his friends would hand over the vast property and responsibilities of the Metropolitan Water Companies!

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 225.)

The general tendency of the Stock Markets during the past week was decidedly good. Money was abundant, and high-class securities were in demand. Conspicuously noticeable is the rise in Home Railways; the increased dividends for the first half of the year being very encouraging. Though not directly concerning our special department, this favourable feature is worth a passing remark, as it springs from improved trade; and improved trade benefits all commercial industries and undertakings. The Gas Department is beginning to show symptoms of the slackening off of business, and has been much quieter; but its general firmness remains unimpaired. Gaslight "A" has been moderately dealt in, and marked as high as 268½; but the closing figures were rather easier. A very little was done in the secured issues, and two of them are each a point higher. In South Metropolitans, the "B" has been unusually active, but the quotation remains unchanged. A solitary deal in old was all the business done in Commercial. In Suburbans and Provincials British alone came in for notice, and all the old quotations stand good. Foreigners are chiefly remarkable for the demand for their debentures—secured issues being generally wanted; and Metropolitan of Melbourne are 2 higher. Buenos Ayres has fallen back ½, and Oriental has not made any recovery. The Water Companies have been very fairly active, and show a large accession of strength. Here, again, is to be found the demand for debenture stocks as high-class investments for money. The changes in quotation are numerous and considerable, ranging from 6 per cent. in Grand Junction down to 1 in East London. Kent, however, was officially quoted on Saturday at a considerable reduction.

The early operations were: Moderate business in Gas on Monday, largely in South Metropolitan "B" and debenture; but nothing moved. Water business was nearly all in debentures of various undertakings; that of New River rising 1. Tuesday's operations in Gas were not remarkable. They were mostly in the Metropolitan Companies' issues, and Gaslight "H" advanced 1. Water was rather quiet, but full of rise. Lambeth improved 2; Grand Junction, 1½; Southwark ordinary, 1½; and ditto "D," 1. On Wednesday, dealings in Gas were at their scarcest; and the only feature was a rise of 1 in Gaslight 4 per cent. debenture. Water continued quiet, but East London and Southwark "D" rose 1 each. Transactions in Gas were only moderate on Thursday; but prices were good. Metropolitan of Melbourne advanced 2. Water was little touched, and remained unchanged. Friday's business in Gas was largely in South Metropolitan "B;" but little was done in the bigger issues. No business was marked in Water, although further advances were recorded—viz., a rise of 1½ in Grand Junction, and of 1 in each of the Southwarks. On Saturday, two or three transactions in the bigger issues were all the business in Gas; and prices were scarcely so good. Buenos Ayres fell ½. Water was surprisingly active; and further improvements in quotation took place. Chelsea and Lambeth advanced 3 each; and West Middlesex, 2. Kent, as remarked above, was put down 4½.

ELECTRIC LIGHTING MEMORANDA.

THE PARIS TRIALS OF ELECTRIC METERS—THE FORTUNES OF THE BRUSH COMPANY—AN ELECTRICAL EXHIBITION IN BIRMINGHAM—THE COST OF ARC LAMPS IN NEW YORK.

It is reported that there are a number of entries for the prizes offered by the Municipality of Paris for electricity meters suitable for use in connection with central station lighting. The Committee charged with making the awards have set to work, and therefore in a few months it is possible that a report on the subject may be forthcoming. French men of science never hurry themselves, however, and it may easily happen that electricity meters will be in full work in other parts of the world before the Paris Municipality are officially informed which is the best of the present collection. The only competitors whose names can be said to be widely known are MM. Ferranti and Serrin. All the others are purely local celebrities, if they are celebrities at all. Mr. Edison has sent his electrolytic meter, but not in competition for a prize. He does a trade in these appliances, and probably looks to this for his reward in preference to the approval of a jury of experts whose opinion may or may not agree with that of the public. As it appears that the instruments submitted in competition are not to be patented, but are to be put upon the market for what they are worth, it is not likely that the scheme will do much good. Any electricity meter that is really worth consideration would be a fortune to its inventor just now, who would scarcely relinquish, at the bidding of the Paris Municipality, his prospects of gaining profit and renown in every other part of the world. A good and cheap electricity meter is undeniably one of the needs of the day; but there is little or no visible progress in the direction of the production of such an article.

The necessary extraordinary general meeting of the Anglo-American Brush Electric Light Corporation, Limited, has been held for the consideration of the reconstruction proposal mentioned in last week's Journal; and the scheme was, of course, adopted. Lord Thurlow, Chairman of the Company, who presided, said that the proposals submitted to the shareholders had been arrived at as the result of a great deal of care and deliberation on the part of the Directors, who confidently recommended them as calculated

to advance the interest of the shareholders. The best piece of news Lord Thurlow had to tell his auditory, however, was that their tedious litigation with the Edison Company, which had caused great anxiety during the past two or three years, is ended by virtue of an agreement on both sides which is simply a compromise. The Lane-Fox patents are left to stand as they are; and the Edison and Swan Company consent to admit their validity so far as to become licensees under them. On the other hand, the Brush Company consent to give up the manufacture of lamps, and agree to purchase all they require of the Edison and Swan Company on the most preferential terms. This agreement will be a disappointment to the many who were looking forward to the issue of the litigation as possibly destroying all real patent right in incandescent lamps. It is likely that the recent legal decision in America with regard to the Sawyer and Man patent may have had some influence in bringing the Brush and Edison people on this side of the water into accord for the purpose of mutual protection. Mr. Lane-Fox himself, it appears, does not altogether admire the arrangement between the two Companies, and declares his intention of starting a lamp manufactory on his own account as soon as he has a chance. With regard to the other points in the programme of the Brush Company—the acquisition of the Falcon engineering works and the absorption of the Australasian Company—there are not wanting those who declare these steps, now irretrievably taken, to be unfortunate. Time will show.

An Electrical and Industrial Exhibition which is expected to be interesting is to be opened in Bingley Hall, Birmingham, on Thursday next. It will not be the fault of the organizers of this enterprise if it is not accepted as the best as well as the latest exposition of the condition of the various industries depending upon electricity. The peculiar industry of which Birmingham is the centre is always ready for an exhibition, and it is therefore not surprising to learn that all the space available was taken up as soon as the scheme assumed definite shape. The hall will be mainly occupied, therefore, by Birmingham manufactures, the electrical exhibitors being in the minority. Yet it is reported that most of the leading electrical apparatus makers of the country will be represented there; and no less a personage than the great Edison himself is expected to honour the exhibition with his presence. If he could only be prevailed upon to show himself at a stall of his own, and give daily demonstrations on his own inventions, it would doubtless be the greatest attraction that the Committee could provide for visitors. As it is, however, it appears that Mr. Edison is paying his first visit to Europe in connection, of course, with the Paris Exhibition, and has accepted an invitation to make a call on Birmingham on his way, for the purpose of seeing what British electricians can show him. The Birmingham people have wisely learnt to dispense with the obsolete system of prize awards in their local exhibitions; allowing exhibitors to appeal to the public on their own merits. The proceeds of the show will be devoted to the three principal charitable institutions of the city; and altogether the enterprise deserves to succeed.

Recent proceedings of the City Gas Commission of New York have resulted in bringing to light some curious features of American electric light enterprise. Tenders were asked for some time since for arc lamps for the streets; and in June a number of offers were received which were summarily rejected. They were not only higher than the Commission expected, but they also presented a striking uniformity in appearance, which gave the alarm to an authority not without experience of "rings" and similar private arrangements among ostensibly competing contractors. Fresh tenders being called for, there speedily came a break-up of the temporary combination. Discovering the impossibility of doing anything collectively, the electric lighting companies appear to have gone in for competition without restraint or mercy. One began by protesting against another on the ground that it was an intruder, and the suicidal strife waxed until the conventional prices for arc lighting were hopelessly discounted. It was as in the national game of poker, with the difference that every company in turn offered to "go lower" than the others. The result was to bring down the tenders in the districts where competition was fiercest to as low as 20 cents per night. It is noticed that where the service is required to be by cables laid in subways, the charge averages 9 cents per night more than where overhead wires may be employed. At the lowest price offered the charge for an arc lamp would be $73, or about £15, per annum, whereas formerly the rate was $255·50, or more than £51, a year when the business was in a few hands. Under these circumstances, it may be easily inferred that the "progress of electrical science," of which we hear so much, is not altogether admired by electricians themselves, seeing that they are thereby required to work for next to nothing. It is, of course, impossible that arc lighting can pay at the price above mentioned. It can be done in New York at a profit for about £20 per lamp per annum, or nearly the same figure as in England; but any company proposing to do the work for less must look for profit to something beyond.

The £25,000 of 4 per cent. debenture stock of the Lambeth Water Company has been allotted at prices averaging £124 5s. per cent.

Mr. Burdett Loomis, of Hartford, Conn. (U.S.A.), the inventor of the combination water and producer gas-making process for bituminous fuel which bears his name, is at present staying at the Hotel Métropole, London; having come to England to introduce his system, the agency for which has been taken up by Messrs. Newton, Chambers, & Co., Limited, of Sheffield.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Dunfermline.

The Twenty-eighth Annual Meeting of the North British Association of Gas Managers was held at Dunfermline last Thursday. Curiously enough, this Association, which is said to be the parent of all other organizations of a similar kind—now forming a very numerous progeny, both at home and abroad—had its origin in this county, which is playfully called the "kingdom of Fife." On this occasion, the story of its origin may be very briefly told, as there are many Scotch gas managers, and readers of the Journal generally, who do not know it. In the month of January, 1862, four gas managers met by mere chance in the office of Mr. William Mackenzie in the county town of Cupar Fife, when he had charge of the gas-works there. In the course of conversation, he suggested to his visitors the idea, which had long been in his own mind, of forming an association of members of the gas profession. The suggestion was readily taken up; and the outcome of the conversation was that he agreed to invite all the managers of Fife, as well as of the counties of Kinross, Perth, and Forfar, to a meeting in Cupar, to be held in July of the same year. He did so; and his invitations brought forth a large meeting in which, by the way, there was no "trade element;" and on the occasion in question the Association was formally established, with Mr. Lowden, of Leven, as the President, and Mr. Mackenzie as Secretary. The last-named gentleman had previously drawn up a code of rules which he submitted to the meeting. These were discussed and adopted; and they are substantially the same at the present time as when they were drafted. At first the Association practically consisted only of members belonging to the four counties already named. St. Andrews is the only other Fifeshire town in which any meeting of the Association, in its present enlarged form, has taken place, besides the one of the present year. That meeting was held in 1879, on which occasion the highly-respected Manager of the ancient city—Mr. J. Hall—was the President. Mr. Hall was not one of the original members; and it would seem to be the case that there are now only three of these gentlemen left. These are the venerable Mr. Whimster, of Perth, Mr. Myers, of Broughty-Ferry, and Mr. Mackenzie himself, who continued up till the St. Andrews meeting to discharge the duties of Secretary with an amount of zeal, enthusiasm, and efficiency rarely equalled, and probably never excelled. Not long after retiring from that office—in which, by the way, he was succeeded by Mr. D. Terrace, then of Arbroath, and now of the Dawsholm Gas-Works of the Glasgow Corporation—Mr. Mackenzie was elected to the chief office in the gift of the Association. This circumstance leads us to mention the interesting fact that the parent-country of the Association has already given to it three of its Presidents—namely, the before-mentioned Mr. Hall and Mr. Mackenzie, and Mr. A. MacPherson, of Kirkcaldy, one of Mr. Hall's pupils and assistants, and in every sense a man who is worthy of his master.

Since the formation of the Association, the gas industry has made very great strides throughout Fifeshire, which is a thickly-peopled county, with a gas-works not only in every town, but in almost every village where the population ranges from 300 inhabitants and upwards. In the large towns, such as Kirkcaldy and Dunfermline, the increase in the consumption of gas has proceeded by "leaps and bounds." Taking Dunfermline alone, we may state that, when the Association was brought into existence, the yearly make of gas was about 13 million cubic feet, whereas the annual production has now risen to about 55 millions.

At the opening of the meeting last Thursday, which was held in St. Margaret's Hall (Saint Margaret, by the way, is spoken of as the patron saint of the "auld grey toon," the queen of that name having been the wife of Malcolm Canmore), the chair was taken by Mr. George R. Hislop, of Paisley, the President for 1888-9. On the platform with him were Mr. S. Stewart, of Greenock, Mr. A. MacPherson, of Kirkcaldy, Mr. R. Robertson, of Bathgate, and Mr. R. S. Carlow, of Arbroath (the Secretary of the Association); and in the body of the hall there was a large attendance of members gathered from widely distant parts of the country, and many of them well-known members of the profession.

On the part of the Committee, Mr. Carlow read a very satisfactory report for the past year. In regard to the Special Sub-Committee appointed last year, at the request of Mr. W. Young, to consider and report upon the subject of the purification of gas by recent processes, it was stated that nothing had been done, and that, by request of that gentleman, the Sub-Committee was recommended for reappointment. As to the Benevolent Fund, the report stated that only £5 had been expended in the course of the past year, as compared with £20 in the preceding year. The report included a reference to the Murdoch Memorial Fund, to which £15 8s. had been added during the year; including a handsome subscription from the Marquis of Lothian, Secretary for Scotland. It was also recommended that the Benevolent Fund Committee should be reappointed for another year—Mr. D. Terrace to be the Secretary. The report stated that there had been a falling off in the membership of the Association, partly by deaths and resignations, but chiefly owing to defaulters—members who had fallen into arrear with their subscriptions; but with the additions to be made at the meeting by the election of new candidates, the roll would stand thus: Ordinary members, 161; extra-ordinary members, 58; associates, 15; honorary members, 3—making altogether a total of 237. Amongst the candidates for election as ordinary members, Mr. George Malam, of Dumfries, son of the late Mr. A. Malam, was mentioned. The annual

report in reference to financial matters (a statement regarding which was made by the Auditor, Mr. D. Bruce Peebles, of Edinburgh) mentioned the allowance of £10 10s. to the Secretary, which led to some objections being offered by Mr. W. Key, of the Tradeston Gas-Works, Glasgow, who thought the work of the secretarial office might be done by one of the members for the honour of the position. This led to a considerable amount of discussion. No other speaker seemed to take the same view of the matter as Mr. Key; and some of the members thought the allowance to the Secretary should rather be increased than diminished. Mr. Peebles spoke highly of the manner in which the books were kept by Mr. Carlow as Secretary and Treasurer. The report and the various accounts were passed; and a hearty vote of thanks was awarded to Mr. Peebles for his services as Auditor. There was some conversation on the question of allowing Mr. John Reid, of Edinburgh, a former President of the Association, to resign his membership; and it was eventually agreed to transfer his name from the list of ordinary to that of honorary members.

The Presidential Address.

Subsequently Mr. Hislop proceeded to deliver his presidential address. After briefly referring to the healthy condition of the Association, as compared with the "crippled" state of The Gas Institute, owing to the strife of the opposing factions, the President went on to note the continued soundness of gas supply undertakings generally, as compared with altogether rival concerns. Without reviewing minutely and in detail the leading facts of the gas industry of the past year, he selected only a few points to touch upon. One of them was the question of water in coal, the presence of which was, he said, a fruitful source of annoyance and vexation to the gas manager. In dealing with this topic, he strongly urged that in all gas-works there should be abundance of storeage room for the coal, so as to ensure that it should always be dry when charged into the retorts. Next to dry coal he urged that high heats should be employed in carbonizing; and this led him to say something of the different systems of regenerative firing, regarding which he made some valuable suggestions. Next in order, and by natural sequence, he dealt with the question of conbining different kinds of coal—such as cannels and splints—in the retort; and showed how such a combination as he suggested would lead to the production of gas of a higher illuminating power than might at first sight have been suspected. The question of improving condensation and purification of gas also received some attention from Mr. Hislop; and then he passed on to speak of the various new systems of guiding for gas-holders, making special reference to that invented by Mr. Gadd, of which, however, he was not much enamoured. He also spoke at some length of the wrong and the right methods of charging gas for the first time into a new holder, so as to avoid the risk attending explosive mixtures of gas and air, and sending to the consumers a kind of gas very low in its illuminating power. Electric lighting came in for some well-considered and appropriate remarks, the more especially as the gas manager might possibly at some future time be called upon to supply electricity as well as gas. He urged that every gas manager should educate himself in the principles of electrical science, so as to fit himself for all the exigencies of his position; and he must do so, he said, without failing, by energy and zeal, to demonstrate the superiority of coal and cannel gas, for the purposes of light, heat, and power, over all other rivals. Water gas was the most recent rival in the field with which gas managers had to contend; and regarding it he observed that of itself it possessed no luminosity, that it was dangerously poisonous if inhaled, and that, if employed for heating purposes, it possessed only one-half of the heating power of ordinary coal gas, and therefore considerably less than one-half that of cannel gas. From such facts it would be seen, he said, that it could not approach coal or cannel gas in value or efficiency. After a few additional remarks, Mr. Hislop brought his excellent "inaugural" to a close; and he was awarded, on the motion of Mr. S. Stewart, a very hearty vote of thanks for it. By the way, the suggestiveness of various remarks made in the course of his address was several times referred to by speakers in the discussions which afterwards arose on the papers read by the members, as detailed in the programme.

Mr. John M'Crae on Main Laying.

Coming now to the papers, the first was entitled "Notes on Main Laying;" the author being Mr. John M'Crae, of Dundee. After making a few remarks regarding the very indifferent quality of the cast iron of which pipes had been made in recent years (some of them being so brittle that they would sustain comparatively little external pressure), he proceeded to say that the destruction of gas-mains has of late been much increased by steam traction-engines, the use of which was one of the points of his notes. Supposing they laid a long distance of gas-main, and the street was not left so smooth as they found it, the zealous burgh surveyor, anxious to restore the thoroughfare to its original beauty, applied his heavy steam-roller to the track, with the result that in many cases, owing to the rapid and severe crushing down or consolidation of the roadway, the main was subjected to a pressure which it was unfit to withstand, and fracture was the result. The service-pipes, too, which were generally connected at right angles to the main, were either disconnected or broken. He supposed it had been ruled that these steam-rollers and traction-engines, &c., were to be classed as ordinary traffic; and gas suppliers must, therefore, see to their property not being injured by them. With this view, he suggested that all cast-iron pipes should be composed of iron of a known brand, which should be able to withstand a given pressure; and that samples of the iron should be taken while the pipes were being cast. He referred to the test bars specified by Mr. J. Watson, the Dundee Water Engineer; and then remarked that he would have the pipe laid at such a depth as to be, as far as possible, beyond the reach of the strain caused by extraordinary traffic. Under general circumstances, a depth to ensure a cover of 2 ft. 6 in. should be sufficient. A large trunk main, not likely to be disturbed for services or connections he would lay much deeper. An advantage of increased depth was the removal of the pipes from atmospheric variations, and consequently the prevention of excessive condensation of the richer hydrocarbons. For some years he had adopted the practice of laying the mains almost under the side channels of the streets; thereby escaping the heavy traffic, and causing little interruption in lifting and relaying. In an important street, he would lay the main on either side, and so avoid what was always a source of great loss of gas and annoyance—namely, crossing pipes. If the street had only a few consumers on the side opposite that on which the main was laid, he would have one crossing main, with a small main running in front of the buildings to be supplied; and he would avoid as far as possible crossing mains or services.

Mr. M'Crae subsequently remarked, in reference to the laying of mains, both large and small, that it was not only desirable that the joints should be carefully made and be perfectly gas-tight to commence with, but that they should be laid on a solid bed; otherwise the permanency of the work could not be ensured. Then there was the question of coating the mains, both to hinder corrosion and to reduce the friction; and he gave the results of his experience on the matter. He recommended that the mains should all be of ample capacity; and this recommendation came, he said, with special force in these days, when gas-engines are becoming so generally adopted—frequently causing annoyance from the oscillation of the gas-lights in their neighbourhood. A large main served as a reservoir from which a gas-engine could be supplied without inconvenience to anyone. The author then made some excellent suggestions in regard to service-pipes—how they were to be laid, and how connected with the mains. He was much opposed to having screw connections between the mains and the services, and gave his reasons for his practice. He also made some remarks as to the weights of service-pipes, which he thought were generally far too light; and he mentioned the weights of the pipes which he himself used for services up to 3 inches in diameter, as the result of long experience in his own practice. In reference to malleable iron service-pipes, he said he would on no account lay them without having them properly coated to prevent oxidation; and all such pipes received from him two coats of the best red lead. Then, as to the material in which the service-pipes were laid, great care should be observed, especially if the soil contained anything like ashes. In concluding his remarks, Mr. M'Crae mentioned his practice in regard to large service-pipes for supplying mills, factories, and other extensive works; stating that he did not put meters in every part of the works, and carry service-pipes to each of them—his rule being not to place the meters and pipes beyond the control of the gas people, but to place a large meter in or near the lodge at the gate, to which the service-pipes were connected, leaving the consumer to carry the pipes wherever he wished.

A long discussion took place upon the questions raised by Mr. M'Crae; and generally the speakers complimented him upon the practical and useful character of his paper. The first speaker was Mr. Whimster, of Perth, who regarded the depth of 30 inches for the mains as a very suitable one—never in his own case coming nearer the surface. In some places he even went down to a depth of from 7 to 7½ feet. As to laying malleable iron service-pipes, he mentioned his plan as to jointing them with the mains, and stated that he not only coated them with red lead, but he also placed them in a box for protection—a practice which, he said, ultimately repaid itself well. Mr. Bell (late of Clippens, now of Edinburgh) made some remarks on the coating of pipes inside; and Mr. Smith, of Aberdeen, also spoke on the same subject—stating that in his case the ordinary coating inside such pipes had come off. Mr. Mackenzie, of Dunfermline, said one of his 2-inch pipes had become quite blocked up with the tar coating that had been dissolved off the inside. Mr. Macpherson, of Kirkcaldy, agreed with the author of the paper in regarding the quality of the iron used in making the pipes as an important factor in their durability. The nature of the soil was another; and any bad soil that was met with in a pipe-track should be removed, and good material substituted. He had found the internal coating of pipes very speedily removed. As to unaccounted-for gas, he said that it was not wholly due to leakage from bad pipe-laying, but also to the temperature of the gas being lowered too much—a subject on which he enlarged to some extent. Mr. D. M. Nelson, of Glasgow, recommended that the coating of the pipes with a protecting mixture should be done after the laying of them, and on the outside only; and Mr. M'Gilchrist, of Dumbarton, had only one suggestion to make, which was that the tar used on the inside of the mains should be added to the outside of the service-pipes. Mr. Key gave his experience in laying mains and service-pipes in Dumbarton. Mr. T. D. Hall, of Montrose, said his own practice with service-pipes was, as far as possible, to connect them with the tops of the mains; and as to the coating of the pipes with tar mixture, he agreed with Mr. Nelson. The President, in summing up the discussion, remarked that he was in favour of

coating pipes outside; and urged that pipes should be cast on end. His own practice was to lay pipes under the footpaths on both sides of the street; and where a large main had to be employed, he placed it in the roadway, but very deep. Mr. M'Crae replied very briefly; observing that the criticism was better than the paper. As to Mr. Bell's remark about the removal of the tar coating from the inside of the mains, by the action of the gas and liquid hydrocarbons, he said that he had not had the same experience as this gentleman, nor had he found that the paint used inside a gasholder had been taken off by the action of the gas, even after the holder had been 31 years in use.

Mr. MacPherson on a Retort-Setting for Small Gas-Works.

Mr. A. MacPherson, of Kirkcaldy, read a short paper on this subject, which he illustrated by means of a diagram. The retort-setting he described had been devised by himself, and was now in actual use at the Dysart Gas-Works. After making a few remarks regarding the anxiety shown in recent years by the managers of small works to obtain some of the benefits which accrue by the use of regenerative settings, he went on to show how he had attempted to design a setting to effect that purpose. It very much resembled the ordinary setting of three retorts in one oven; but he had introduced a "new departure" in drawing the primary air along the top of the main flue in a space specially formed for the purpose, after which it was passed under the setting, and immediately beneath the fire-bars of the furnace. These bars were placed at a considerable angle, so as to obtain as great a depth of fuel as possible. He then introduced what he said might be termed a secondary air supply by forming flues under those used for heating the lower retorts, that supply of air travelling to and fro, and being ultimately led up through three spaces formed in the cheeks of the furnace, and discharged into the latter immediately over the fuel, so as to be brought into actual contact with the gases emanating from the same. By this arrangement he had secured a considerable rise in temperature, as compared with that obtained in the old settings, and at a much reduced cost for fuel, which amounted to about one-third of the quantity formerly required. The spent coal was drawn red-hot from the top retort into a hopper placed in an opening between the mouths of the two lower retorts; thus saving all need for shovel-firing.

In the discussion which followed the reading of this paper, remarks were made by several members, including Mr. Key, Mr. J. Hall, Mr. M'Nair, of Wishaw, Mr. T. Hall, Mr. Bell, of Peebles, Mr. Robertson, of Dunoon, and the President. The manner in which Mr. MacPherson had secured the successful results mentioned in his paper was generally much commended. In the course of his reply, the author stated that there was a sort of lazy action in the mixture of the air and gas in the combustion chamber, and that there was no extra heating so as to bring about destructive action on the brickwork.

An Ideal Gas Company Realized in New Zealand.

It may be remembered that at last year's meeting of the Association, held in Glasgow, a paper on the subject of "Selling Gas" was read by Mr. J. M'Gilchrist, in the course of which he advanced certain points, or principles which, when taken as a whole, formed in his opinion the bases of an ideal gas company. He admitted that there was some ground for the opinion expressed during the discussion on the paper that his ideal company was rather chimerical in character and composition; but still he thought those persons who had expressed this opinion must now have come to his way of thinking, if they had in the interval given fuller consideration to the subject. This ideal company had been regarded somewhat like the ideal man; but he was prepared to prove that it really existed, and that it was, of course, the product of the human mind. Such a company as he had pictured to himself and to the members, strange to say, really existed, although he did not know of it at the time of reading his paper last year; and, stranger still, the company existed at the Antipodes, where gas making as an industry was yet in its infancy. The science of selling gas, however, at the place referred to was greatly in advance of the practice in this country. After giving an interesting introductory statement, Mr. M'Gilchrist mentioned that his ideal gas company had been realized in the town of Napier, New Zealand; the Manager of the gas-works being Mr. Charles H. Edwards. This gentleman had seen the paper and the report of the discussion thereon; and he at once communicated with the author of the paper, informing him that his ideas had been already put into practical operation by the Company of which he was the Secretary and Manager. The letter sent by Mr. Edwards was of a highly interesting character, and Mr. M'Gilchrist embodied it in its entirety as part of his paper of the present year. In the course of his communication, the New Zealand Manager dealt in detail with all the points which Mr. M'Gilchrist had raised, and stated unreservedly that they were each and all in practical operation in connection with the Napier Gas Company, Limited. We may mention, in passing, that Napier has a population of 7000; that the consumption of gas, which was 4½ million cubic feet in 1878, was expected to amount to 17 million cubic feet in the past year—the population during the decade having only increased to the extent of about 1500. As to the hiring out of apparatus, which was one of Mr. M'Gilchrist's points, the letter from Napier stated that upwards of 200 cooking-stoves were in use, and about 120 heating-stoves; while boiling-burners, bath-heaters, and iron-heaters were in use by almost every consumer. All the gas burned in this way was subject to a larger discount than the gas used for lighting; and separate meters were put on for it. As regards the payment, Mr. Edwards stated that their system of collecting gas-rents was monthly, and not bi-weekly or weekly as had been recommended by Mr. M'Gilchrist. The net price of the gas used for lighting was 10s. per 1000 cubic feet; and that for stoves and engines, 6s.—being the cheapest in the colony. With an annual income of £7753, the amount lost by bad debts was only £3 9s. 4d.—a percentage which could only be described by a decimal. The day consumption for stoves and engines, when the letter was written, was about 31 per cent. of the total amount, and was on the increase. As might naturally be supposed, this communication from Mr. Edwards excited a considerable amount of interest among the members.

Considering the full discussion which the subject received last year when it was first brought forward, it was not thought desirable to re-open it, and go over the same ground. Mr. MacPherson, in the course of a few remarks, gave it as his opinion that the system of selling gas and pushing business described in the letter ought to be possible in this country if it was practically carried out in New Zealand. Following up a suggestion made by Mr. M'Gilchrist at the close of his paper, Mr. S. Stewart proposed that a Committee should be appointed to consider the subject, and bring up a report. The President expressed himself in favour of action being taken in this way; and the motion was seconded by Mr. MacPherson. Eventually the matter was remitted to the Research Committee, from whom a useful and suggestive report may be expected at the next meeting of the Association. It was agreed to send the best thanks of the Association to Mr. Edwards for his interesting and valuable communication.

Forty Years' Experience with Purifiers.

Mr. J. Hall, of St. Andrews, who is now seventy years of age, therefore well entitled to be regarded as an "old hand," detailed experience with purifiers over a period of almost forty years. Beginning in 1851, when the yearly make of gas was 3,706,000 feet (price 8s. 4d.), the superficial area of each of three purifiers was only 18 square feet; making 54 square feet in all. They were so arranged that, before any one of them could be changed, the make of gas had to be stopped; the result being a great waste of lime, of which 39 tons were used in one year. He went on to mention the changes made in the purifying plant, and the extensions of the same in subsequent years. In 1888 the make of gas was 22 million cubic feet, and the lime used only 48 tons; upwards of 2000 cubic feet of gas being purified for 1d., and the price of gas being reduced to 3s. 7d. In this year also the purifiers were still further increased in size. Mr. Hall stated that the few general notes submitted to the members were intended to show the advantage of large purifiers in the saving of materials—lime and oxide—and labour, in reducing the pressure and speed, and in the security given for the purity of the gas. The new purifiers he had in use had each a superficial area of 160 square feet, and was capable of easily dealing with 200,000 cubic feet of gas in 24 hours.

As the paper was not much more than a simple record of facts, there was little room for discussion upon it; but a few remarks were made by several of the members, including Mr. Adam, of Pollockshaws (who stated that, instead of 118,630 cubic feet of gas being purified by each ton of lime used on the old system in vogue at his works, he was now able to get a ton of lime to purify 201,072 cubic feet), Mr. Key, Mr. J. B. Terrace, of Brechin, Mr. T. D. Hall, and the President, each of whom mentioned some bit of his own experience, or contributed a useful suggestion on the subject. Mr. Hall made a brief reply.

Sunday Labour in Gas-Works.

This subject, which has often been discussed at meetings of gas managers, was dealt with in a paper submitted by Mr. T. D. Hall, whose father had just engaged the attention of the meeting on a totally different subject. Like his father's paper, it did not profess to give anything specially novel on the subject; but it stated that at the Montrose Gas-Works it was the rule rather than the exception not to make gas on Sundays—at all events, between the hours of 6 a.m. and 6 p.m. The make of gas at Montrose is about 26,000,000 cubic feet per annum; and the maximum daily production about 150,000 cubic feet, for which there is ample holder capacity. While the rule during the week is for the stokers to be twelve hours on duty, Saturday is divided into three shifts of eight hours; each gang of workmen taking eight hours alternately. The last charging of the retorts is done at 5 o'clock on the Sunday morning; so that by 8.30 a.m. the charges are all worked off, and the lids are slackened as each charge runs out, When the flame disappears at the mouthpieces, the lids are screwed up again, to keep the air out of the retort and prevent the coke from burning. Mr. Hall mentioned other details of his work attendant upon this mode of dealing with the carbonizing operations; and said that by keeping his manufacturing power a little above his actual requirements, he was not only able to give his stokers a rest on Sundays, but was relieved of some worry himself. This was his share of the benefit derived from cessation of work on Sundays.

Mr. D. M. Nelson, who opened the discussion upon this paper, said he considered that Mr. Hall had made an important contribution to the literature of the subject he had treated. Mr. J. Hall, briefly mentioned his experience regarding Sunday labour in gas-works; but he admitted that he had not yet arrived at the same point as that reached by his son. The President made a few remarks on the subject; referring more especially to the difference that might be expected to exist between manufacturing towns and residential towns on the score of the demand for gas on Saturdays,

Mr. A. Smith, of Aberdeen, who was pointedly referred to in the course of the paper as having brought the question of Sunday labour before the Association, five years ago, was not present at the time the discussion was going on, otherwise he might have been expected to report as to the progress made during that period in securing that Sunday in gas-works should be a day of rest.

Sulphur Compounds in Mineral Illuminating Oils.

The paper which was submitted on this subject by Mr. A. Bell, junr., of Peebles, may be regarded as the "event" of this year's meeting of the Association, as it certainly was not surpassed in interest even by Mr. M'Gilchrist's additional contribution to the question of "Selling Gas." It had an interest peculiarly its own, and one which was generally admitted to be of the very greatest importance to the gas industry. Mr. Bell, who is quite a young man, and has only been a short time in the position he now holds, may be regarded as having already "won his spurs." He was formerly assistant to Mr. W. Young, of the Clippens Oil-Works, who, as our readers are aware, has on several occasions contributed papers (experimentally illustrated) on subjects of considerable interest to gas managers inclined to study the science of their profession. From this connection with Mr. Young, it is natural to suppose that Mr. Bell is deeply imbued with a scientific turn of mind. This, however, was evident from the manner in which he had approached his subject, and in which he had carried out his investigations as indicated in his brief (some of the members thinking it too brief) contribution to the proceedings of the Association. In an early part of the paper, the author mentioned that some months ago, at the suggestion of Mr. Young, he had entered on a course of experiments with regard to the purification of coal gas from sulphur compounds other than sulphuretted hydrogen, by means of liquid hydrocarbons—a subject forming part of the elaborate paper read by Mr. Young at the Stirling meeting of the Association two years ago, when Mr. Bell had the privilege of assisting him. These experiments were not yet sufficiently advanced to allow Mr. Bell to state anything definite regarding the purification of coal gas from sulphur compounds by the use of liquid hydrocarbons; but he held out the hope that at some future date he might have the pleasure of laying before the Association a paper on the subject. This announcement evidently pleased the meeting. For the present he confined his remarks to that part of the experiments which led him to investigate the subject of the paper in hand. One of the liquid hydrocarbons which he used was paraffin spirit, which, like many other chemists, he had regarded as a pure hydrocarbon compound; but as he went on with his purifying process—as he thought it to be—he found that the gas, after passing through the purifier, had in it sulphur equal in amount to 35 grains per 100 cubic feet, or two-and-a-half times the amount that it originally contained! He subsequently examined the paraffin spirit with great care, with the result that he found it to contain sulphur in combination to the extent of 0·217 per cent., or, in other words, 112 grains per gallon; and on inquiry he learned that his sample of spirit was but partially refined. He was then led to infer that possibly illuminating mineral oils might also contain sulphur compounds. Forthwith he proceeded to make a rough test of a sample of paraffin oil for (possibly) contained sulphur. The reply to his question was: Sulphur compounds present in a decided quantity. He next proceeded to ascertain the extent to which such compounds exist in typical samples of the principal oils manufactured (all Scotch), as also in some samples of petroleum oil. Taking the average results obtained by Dr. Letheby, Mr. L. T. Wright, Mr. F. W. Hartley, and others, in the way of determining the amount of oil equivalent in luminosity to 1-candle power per hour, he found that they gave 47·73 grains. Having obtained the weight of oil equivalent to 1-candle power per hour, he had only to multiply this by the candle power of 100 cubic feet of gas and by the percentage of sulphur in the oil; and the product would show the number of grains of sulphur contained in a quantity of oil which, during its combustion, would give light equal to that of 100 cubic feet of gas. In a very instructive table, Mr. Bell showed the results of his experiments with the various oils examined; and when extending the results, he adopted both Scotch gas (28-candle) and English gas (16-candle) as standards for comparison. For obvious reasons, he refrained from giving the names of the various oils tested. There were twelve samples of Scotch paraffin oil, ranging in specific gravity from ·804 to ·812; the percentage of sulphur contained in them ranging from ·130 up to ·223. Then taking the Scotch gas of 28-candle power, it was found that the quantity of sulphur in the oils equal in illuminating power to 100 cubic feet of gas ranged from 20·5 up to 60·4 grains; while in relation to the 16-candle gas, the sulphur ranged from 11·7 to 34·5 grains. Only three petroleum oils were tested; and the results were eminently instructive. In one case the amount of sulphur obtained was ·0162 per cent.; in another it was ·0160 per cent.; but in the third the amount was ·2410 per cent. In these three cases, as compared with 100 cubic feet of 28-candle gas, the quantities of sulphur were respectively 4·3 grains, 4·2 grains, and 64·4 grains; while, calculated out to 16-candle gas, they were 2·4 grains, 2·4 grains, and 36·8 grains. These results came with almost startling surprise to the members generally; and in concluding his paper, Mr. Bell said that his object in bringing the matter before the Association would be fully served if he had supplied the members with any information which would enable them to combat the popular but mistaken belief that mineral oil was a more healthy and less noxious illuminant than coal gas.

The paper led to a most interesting discussion; the speakers in which were Mr. Robertson, of Dunoon, Mr. Vass of Portobello, Mr. MacPherson, Mr. Key, Mr. M'Gilchrist, Mr. T. B. Hall, and Mr. Bell's father (who has long been connected with the oil trade). The principal point dealt with in the discussion was the well-known case of the paraffin oil gas manufacture at Colinsburgh, in Fifeshire; the speaker who referred to it being Mr. MacPherson. Mr. Bell was highly commended for his paper; and a confident hope was entertained that in future years he would be able to make further valuable contributions to the literature of the gas industry. In the course of his reply, Mr. Bell remarked that the paraffin oil gas was made from heavy oils, and that it could not fail to contain sulphur. He also stated that the petroleum from Pennsylvania was comparatively free from sulphur; while this impurity was abundant in Canadian oil.

Concluding Proceedings and Excursion.

At the close of the discussion on Mr. Bell's paper, the President moved that the best thanks of the Association be given to the authors of the papers which had been read; and the motion was enthusiastically passed. It was agreed that the Revision Committee should consist of Mr. Hislop, Mr. Carlow (Secretary), Mr. Stewart (President-Elect), and Mr. M'Ghrilcist. The last-named gentleman, as the youngest Past-President at the meeting, proceeded, on behalf of the Association, to thank the out-going President (Mr. Hislop) for his services to the Association. He referred to the fact that Mr. Hislop had now been President three times; and then presented to him the gold medal of the Association, expressing the hope that he might be spared to preside for the fourth, and possibly a fifth time, and that he might never fall off in "illuminating power." Mr. Hislop replied in feeling terms; and then Mr. MacPherson moved that the thanks of the meeting be given to the Secretary; the motion being seconded by Mr. Peebles, and heartily carried by the meeting. Mr. Carlow made a suitable reply, and the proceedings terminated.

Later in the afternoon the annual dinner took place in the City Arms Hotel—Mr. Hislop in the chair, and Mr. Stewart in the vice-chair. In the evening a large number of the members and lady friends had a delightful drive to North Queensferry, where they had a splendid view of the Forth Bridge, now fast approaching completion.

On the following day there was a special excursion of the members with their lady friends to the Clachan of Aberfoyle. Dinner took place in the Bailie Nicol Jardvie Hotel; and an enjoyable afternoon was spent on the shores and at the head of Loch Ard.

MR. A. E. FLETCHER ON SMOKE PREVENTION.

In summarizing last week the report of Mr. Alfred E. Fletcher, the Chief Inspector under the Alkali, &c., Works Regulation Act, 1881, we mentioned the fact that an important section of this official statement is devoted to the subject of black coal smoke, but did not give any particulars of Mr. Fletcher's work in this regard. This is important enough to deserve consideration in a special article; and we therefore now propose to deal with it at some length. By way of preface, the position of the Inspector in respect to this question should be explained. Smoke prevention, as such, does not come within the scope of his responsibilities. The report remarks that "the emission of black smoke is an offence against the Public Health Act of 1875, in which it is declared to be a nuisance rendering the offender liable to be dealt with summarily. . . . The administration of the law against smoke is in the hands of the local authorities." It would appear from this admission that care for smoke abatement is a work of supererogation on Mr. Fletcher's part; but he is, in a sense, compelled to look into the matter, because of the way in which the working of furnaces is mixed up with the generation of the gaseous atmospheric pollutions with which he is directly concerned. The public have reason to be grateful to Mr. Fletcher for his willingness to widen rather than to restrict his sphere of labour, since he and his staff of assistant-inspectors are really the only skilled observers who are in a position to help local authorities to a knowledge of their duty and powers in connection with this question of smoke prevention. Local authorities are admittedly too feeble to deal with the problem; and it is possible that the collection of information by Mr. Fletcher may be a preliminary to some Government measure for putting factory chimneys and furnaces throughout the country under more efficient supervision. However this may be, it is certain that local officials are hampered in their spasmodic attempts to deal with the smoke nuisance, by a variety of plausible objections taken by astute offenders, with which they are not always competent to grapple. Among these is the plea mentioned, by way of illustrating the difficulties of the problem, by the Inspector. He states that in the course of some correspondence on the subject which has recently appeared in the newspapers, it has been argued that black smoke ought not to be lightly dispensed with, because its existence is a guarantee of the absence of carbonic oxide—a poisonous gas calculated to cause very much greater mischief than any quantity of unconsumed carbon. This statement, he says, obtained wide currency, and was seized upon as an excuse to be urged in a Court of Law in mitigation of penalty for the offence of having caused the emission of black smoke. Although this assertion is recognizable by any chemist—and we would add pyrologist—as a fallacy, Mr. Fletcher has taken a great deal of trouble to refute it by publishing analyses of the gases of many furnace chimneys, in order to show the conditions under which the combustion of coal is commonly carried

on. Offending manufacturers are very acute in picking up such excuses, and it is a wonder that more use has not been made for the same purpose of the assertion of some chemists, that if black smoke were obviated the sulphurous acid gas resulting from the clean combustion of sulphurous fuel would be equally objectionable from the point of view of the sanitarian.

As Mr. Fletcher says, however, it is eminently desirable, before anything else is done, to obtain exact knowledge of the conditions under which coal is commonly burnt in factory furnaces. He takes 52 examples of combustion gases produced by various kinds of furnaces, including steam-boiler fires, and those applied to other purposes, some stoked by hand, and others mechanically. Some of the specimens were taken when the fires were clear, and some while smoke was pouring forth immediately after stoking. The samples of gas were taken from works in various parts of the Newcastle and Lancashire districts, and are thus not limited to any particular class of coal. The fuel was all bituminous, however, and therefore liable to produce smoke. Carbonic oxide was not often found, and was always accompanied by such black smoke as indicated imperfect combustion, when not only this gas but also hydrogen and hydrocarbons were to be expected. When the gaseous products of the fire diminish, or the air supply is proportionally increased, so that the black smoke disappears, then in every case, without exception, the highly inflammable carbonic oxide and the other inflammable gas are also burnt.

A good example of a smoky chimney in Mr. Fletcher's table gives the following composition for the effluent gases, as determined by the apparatus devised by Mr. Stead, of Middlesbrough—N, 82·95; O, 3·5; CO_2, 13·25; CO, 0·05; CH_4, 0·25. This was from a Lancashire boiler, hand-fired, burning Durham coal. Another example, of a small-coal fire under a caustic pot at Middlesbrough gave—N, 80·82; O, 1·3; CO_2, 10·95; CO, 3·0; CH_4, 0·70; H, 3·23. After burning clear, this fire gave—N, 84·0; O, 8·25; CO_2, 7·75, and none of the inflammable gases. Small-coal fires, as might be expected, gave most carbonic oxide and carburetted hydrogen, for with these a distillation process goes on when they are first fired. In the case of a Lancashire boiler at Northwich, the use of a steam-jet when stoking appears to have had the effect of preventing the slight smoke which was recorded when it was not employed. There is nothing special in the analysis, however, to show when the steam was or was not added. There are 36 examples of hand-fired, and 16 of mechanically-fired furnaces, and furnaces burning producer gas. The mechanical appliances comprise the Vicars, Jukes, Sinclair, Bennis, Cass, Hodgkinson's sprinklers, and M'Dougal arrangements. All are returned as smokeless furnaces except three, which are classified as slightly smoky. Mr. Fletcher remarks that the prominent lesson to be learnt from the table is that the fuel in hand-fired furnaces is consumed roughly and without economy, since the proportion between the fuel used and the air supplied varies enormously, while only imperfect use is made of the air that is present, as is shown by the excess of oxygen in most of the smoky fires. Mechanical stokers, once so faulty that they failed to secure general appreciation, are, he thinks, greatly improved; so that they are fast growing in favour with fuel consumers. Some completely prevent black smoke; all of them diminish it. In hand-fired furnaces, it is remarked that there should be some way of admitting air at the right spot—*i.e.*, mixed with the gases—to burn up the large volume of gas given off suddenly on stoking. Hollow bars, and tubular and split bridges are good for this; but the air should be so admitted as to mix well with the gases, and time should be given to the mixture to burn properly before it is hurried into the colder regions of the boiler, where combustion is impossible, It is noteworthy that all the mechanical stoking arrangements mentioned in Mr. Fletcher's list show a high proportion of oxygen in the smoke gases; the lowest being 7·25 per cent. of this gas, and the highest 13·50 per cent. Carbonic acid also ranges from 1·0 to 11·65 per cent.; the average being about 7 per cent., which cannot be called a regular performance. As none of them betrayed much smoke, or gave any indication of the presence of inflammable gases, it must be said of them that they made good use of the superfluity of air which they undoubtedly enjoyed.

The examples of gaseous firing stand in a separate category. Four specimens are cited, all of Lancashire boilers. Three of these are supplied by gas made in a Thwaite's apparatus; and the average composition of the smoke gases is given as about, in round numbers, N, 80·0; O, 13·0; CO_2, 7·0. This is not a great improvement, so far as the utilization of the air is concerned. The other example, to which special attention is drawn in the report, is that of a producer at the works of Messrs. Brunner, Mond, and Co., of Northwich, the composition of the effluent gas being N, 82·0; O, 0·45; CO_2, 17·30; CH_4, 0·25. There was evi- a lack of air here; but the proportion of CO_2 is far above that of any other example. Mr. Fletcher states that special interest attaches to the performance of this particular producer, the design of Mr. Mond, because it not only makes a clean-burning gas, but also saves the ammonia, which under other systems is lost. The amount of this is stated to be 66 lbs. of sulphate per ton of slack—a weight which Mr. Fletcher recognizes as largely in excess of that realized in ordinary gas-works. "During last year a large apparatus has been set to work in which are treated daily 70 tons of coal, and although the details of the apparatus require further elaboration, the main advantages promised have been amply realized, in that a steady supply of gas of high heating power and convenient application has been maintained, along with he expected proportion of ammonia. It is intended immediately to increase the plant so that 160 tons of coal will be converted into gas every 24 hours." The composition of the Mond producer gas was given in Mr. Fletcher's report for the year 1886. It contains about 25 per cent. of hydrogen, and 10 per cent. of carbonic oxide. The gas, after separation of its ammonia, is conveyed in pipes to the furnaces where it is to be burnt; so that it would appear to ignite when cold. Its supply is regulated by a valve, and the air necessary for its combustion is drawn in by the chimney draught. The quantity of air so admitted is regulated by a damper; and so accurately is the adjustment made, that usually the variations are limited to an excess of oxygen on the one hand, or of carbonic oxide on the other, of 0·5 per cent. It is conceded that this close adjustment is not maintained without taking frequent tests of the smoke gases. A sample of these is drawn every three or four hours and examined, and the weekly average of the tests, which are made with a Bunte burette, shows 18·4 per cent. of CO_2, 0·5 per cent. of CO, and 0·2 per cent. of O. The tests are a matter of routine, and are made by the stoker in charge, under supervision by a chemist. The stoker is stated to be so experienced in the matter, however, that he can tell by inspection of the flame when he is working within 1 per cent. of CO on the one hand or of O on the other. It is permissible to remark that equal care in working another system of firing might have similar results. Mr. Fletcher waxes quite enthusiastic over the prospects of stoking in this manner, when it shall come into wider operation. He says: "It is no longer necessary to bring coals to these furnaces, nor to remove ashes; no laborious stoking is necessary; but the gas burns quietly and regularly—doing the work without waste of any kind. There is no smoke to pollute the air, nor smoke and dust to choke the flues. The action on the metal of the steam-boilers is less injurious than that of the ordinary fires, since it is more regular and more evenly diffused over its surfaces, and more duty is got out of the boiler." Here, again, it might be remarked that Mr. Fletcher is crediting general results to a particular system which seems to have caught his fancy.

The remaining observations of the report on the subject of black smoke and its prevention or reduction have already been noticed in last week's JOURNAL. Suffice it, therefore, to say that it is by no means obvious that all the good results expected by the Chief Inspector from a formal competitive exhibition of smoke-preventing furnaces would be secured in the way he has in contemplation, even if such an undertaking could be brought to a satisfactory practical issue. An improvement in the administration of smoke-prevention legislation throughout the country, and the enterprise of inventors, would probably work a complete cure of the evil in course of time; and without the former no attempt to focus the reform in a public display is likely to have any very permanently useful effect. Mr. Fletcher himself is evidently desirous of seeing more efficient control imposed upon the proprietors of smoky factory chimneys, which he manifestly thinks would be good for the public, and also beneficial to the manufacturers. Altogether, the report is worthy of being carefully read by all who are interested in the important subjects to which it refers.

PROBATE of the will, dated Jan. 16, 1877, with codicils made Jan. 21, 1884, and Feb. 7, 1887, of the late Alderman Sir Thomas Dakin, who died on May 24 last, aged 81 years, has been granted. The value of the personal estate has been sworn at £60,530.

IT is announced that Mr. Alderman Woodhouse, who has conducted for several years, with much judgment, the work of the Leeds Corporation Water Committee, is about to retire from municipal life. For two years the duties of Chief Magistrate were confided to his care; and they were discharged with marked ability and dignity. The good wishes of his numerous friends and fellow-townsmen will, we are sure, accompany him on his withdrawal from the Council.

IT is reported that Stapp's Water-Gas Patents, Limited, have entered into a contract with the proprietors of one of the largest factories on the Thames to supply them with carburetted water gas for lighting the whole of their works—about 1500 lights in all. The engineers expect to complete the installation in five weeks, when this system will be in evidence on a large scale in the Metropolis. Several other large contracts are, we understand, dependent upon the success of this one.

WE have received a copy of "Potts' Mining Register and Directory" for the present year, which has lately been issued by Mr. W. J. Potts, of the Atlas Works, North Shields. The utility of this book to all who are engaged in the coal and ironstone trades was recognized by us on its first appearance; and we have only to say, in regard to the volume before us, that the statistical matter contained therein has been carefully revised and brought down to the latest possible date. Several new features have been added, with the view of making the book as perfect a manual of reference for mine owners, managers, and their correspondents as possible. The greater portion of the work consists of the Directory, the value of which is enhanced by a number of well-executed geological maps of the coal-fields. At the same time there is room for a good deal of useful matter bearing upon the general subject of mining, including the continuation of the treatise on mine ventilation commenced in the previous edition. The favour with which the first edition of the book was received was a clear indication that such a work was wanted; and the publisher has now only to make it year by year more worthy of the place it has secured in the offices of coal-owners and ironmasters.

Notes.

Appleing's Chain-Carrying Gear.

A highly-ingenious labour-saving appliance for use in gas-works and other factories has been invented by Mr. T. A. Appleing, of 58, Leadenhall Street, E.C. It consists of a new and simple system of chain haulage, which is capable of universal application where goods and material of any description have to be hoisted or traversed for any distance, and at any vertical or horizontal angle. An endless chain carries at any required intervals pendant rods, terminating in hooks, bearing buckets, skips, slings, or other suitable carriers of materials. This chain receives continuous motion from any source of power by means of a belt or friction clutch, through the action of a peculiar divided sheave pulley which constitutes the invention. In an ordinary pulley, of course, the chain passes over a grooved sheave, which revolves upon a central pin carried by the cheeks of the block. Mr. Appleing simply splits the sheave in half vertically, and separates the halves sufficiently to allow the hanging rods to pass between them. Each half of the sheave consequently revolves independently of the other, upon its own pin. These halves of a sheave, being revolved simultaneously by suitable gearing, drag along the chain with all its hanging hooks. If the divided pulley is fixed in the jib of a crane, the carriers will rise to the jib-head, and then pass through the pulleys and travel onwards with a continuous motion to the place where they are to be deposited. There is the greatest simplicity in all Mr. Appleing's arrangements for applying power to his sheaves, changing direction of the line, providing for a temporary detachment of the load for the purpose of weighing, &c. For discharging cargoes or loading ships and barges with coal, coke, lime, pitch, &c., or for use in excavations, the system appears to be admirable, for it can be made to follow the advance of a line of men digging in a trench or emptying a purifier without suspending work. Although the system is only now being introduced, we understand that several works contemplate giving it a trial.

An Improved Gas Battery.

The improved gas battery which, as mentioned in the Journal a fortnight since, was shown by Mr. Ludwig Mond and Dr. Carl Langer at the recent *conversazione* of the Royal Society, is on the same principle as the well-known invention of Grove 50 years ago for the production of electricity from hydrogen and oxygen gas by the intervention of platinum. The distinguishing feature of the new battery, which has been designed to obtain large currents of electricity by means of these gases, is that the electrolyte is not employed in the free mobile state, but in a *quasi*-solid form; and it is therefore named a "dry gas battery." Each element of the battery comprises a porous diaphragm of non-conducting material, such as plaster of Paris, which is impregnated with dilute sulphuric acid. Both sides of this diaphragm are covered with the finest platinum foil, perforated with very numerous small holes, and on this is deposited a thin film of platinum black. Both these coatings are in contact with frameworks of lead and antimony, insulated from each other, which conduct the electricity to the poles of each element. A number of these elements are placed side by side, or one above another, with non-conducting frames intervening, so as to form chambers through which hydrogen gas is passed along one side of the element and air along the other. One element, with a total effective surface of 120 square inches, which is covered by 1 gramme of platinum black and 0·35 gramme of platinum leaf, shows an electro-motive force of very nearly 1 volt when open, and produces a current of 2 ampères and 0·7 volt, or 1·4 watts, when the outer resistance is properly adjusted. This current is equal to nearly 50 per cent. of the total energy obtainable from the hydrogen absorbed in the battery. The electro-motive force decreases slowly, however, in consequence of the transport of the sulphuric acid from one side of the diaphragm to the other. In order to counteract this disturbing influence, the currents of gas are from time to time interchanged. The battery is said to work equally well with gases containing 30 to 40 per cent. of hydrogen—such as the water gas or generator gases produced by the action of steam or air upon incandescent coal or coke—if these gases are sufficiently purified from carbonic oxide and hydrocarbons; but how this is to be effected does not appear.

The Radiant Power of Flames.

At a recent meeting of the Physical Society of Berlin, Dr. R. von Helmholtz communicated the results of his experiments on the radiating power of flames. The problem which he had set himself to solve was to determine the relationship between the radiant energy of flames and the amount of gas consumed in their production. The latter was measured by the fall of the gasholder containing the gas, and the former by means of a photometer, for every scale division of which the equivalent in heat units had previously been determined by three different methods. The radiant energy of the flames depended upon a number of conditions that were separately investigated, as, for instance, the size and shape of the flames, the quantity of foreign gases introduced, and the ratio of the oxygen to the combustible. For the purpose of comparative measurement, a moderately high flame, 6 millimetres thick, and smokeless, was selected. Luminous flames radiated more energy than non-luminous; and it was proved by an extensive series of careful quantitative experiments, that the radiating power of flames is not dependent upon their temperature. From this important observation, it follows that Kirchoff's law does not hold good for flames—a result which is quite in accordance with the limitations he put to his law with those cases in which heat is directly converted into radiating energy. In the case of flames it must also be borne in mind that chemical affinity comes into play. Dr. von Helmholtz stated the numerical data which he had obtained for both luminous and non-luminous flames produced with a series of gases—hydrogen, carbonic oxide, methane, coal gas, &c. Starting as a basis with Julius's statement that the products of combustion are the only criteria of the amount of radiation, and hence calculating the radiating energy of the flames, he obtained values which in most cases corresponded very nearly with the results of experiment. Finally, Dr. von Helmholtz computed the total useful effect which can be obtained as radiant energy from the gases consumed in the production of flame. From this the interesting deduction was made that it is far more economical to use the gases in question for driving a dynamo to supply incandescent lamps, for the sake of the energy radiated from the latter, than to burn the gases and utilize the energy radiated out from their non-luminous flames. As, however, it is the luminous flame of gas which is chiefly employed for radiant effect, the latter observation is not so clear as could be wished.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXIV.

A voluminous report, prepared by Professors Wurtz and Silliman, upon the Gwynne-Harris process of manufacturing water gas, based upon experiments tried in 1868-9, appeared in the *American Gaslight Journal*, and was reproduced in columns of the Journal*. It commenced by stating that the Gwynne-Harris process claimed to be a successful solution of a problem in the practical chemistry of gas-making, which had been attempted before during the past 30 or 40 years. This was to employ the non-illuminating but combustible gases, produced from the decomposition of water by contact of its vapour with red-hot carbon, in such a manner as to give to them, when united with the gases and other hydrocarbons obtained from bituminous coal, cannel, petroleum, &c., an illuminating power and permanency that should make the mixture equal in quality to the best coal gas, while securing also from the same materials a largely increased volume of gas at a nominal increase of cost. The special features of the Gwynne-Harris process appear to include the use of clay retorts, instead of iron as previously used for the decomposition of the superheated steam; the securing of perfectly dry and highly superheated steam before reaching the anthracite retort, by the use of superheaters of clay set in the hotter part of the arch; distribution of the steam in the anthracite retort, from below upwards, by the use of a false bottom formed of perforated tiles; and special means for securing the full and intimate mixture of the water gas with the illuminating gas produced in separate retorts from bituminous coal or otherwise. These improvements were specially devised to meet the troubles which arose in connection with the attempt to apply White's process in practice, as observed by Clegg, Barlow, and others—such as the difficulty of keeping up the heats of the water gas retorts, which led to uncertainty in the rate of production of gas, and to the formation of large quantities of carbonic acid; and consequently the difficulty in maintaining the strict proportion between the "water" and the hydrocarbon gas, that was essential to the formation of a product of uniform quality. The authors claimed that after five months' experience with the apparatus, they found it successfully met these difficulties, and conformed to the conditions laid down by Mr. Barlow in 1854 as necessary for the successful application of water gas on a practical scale. The retorts were maintained at 1500° or more, with an expenditure of fuel not exceeding 60 lbs. per 1000 cubic feet of gas made; the analytical results showing that the unpurified water gas did not contain more than 10 per cent. of carbonic acid, as an average, and sometimes it could be kept down to 3 per cent. The apparatus used consisted of two benches of three clay retorts, each bench forming a set of apparatus comprising one large water gas retort 9 ft. long by 30 in. wide and 16 in. high, and two lower retorts of ordinary dimensions for distilling coal in the usual way. The insertion of the cellular bottom reduced the dimensions of the top retort to 27 by 13 inches; and it was charged with 860 lbs. of anthracite. The charges for the lower retorts ranged from 250 lbs. of ordinary bituminous coal, to 100 lbs. or less of rich cannels such as Boghead, Albertite, Peytona, &c. These charges were worked off in four hours or less, and were put in alternately, so as to allow the water gas from the top retort to be passed into one of the lower retorts, during the first half of the charge only. A flue passing over the top retort was tried; but after passing the water gas through this before reaching the coal gas retort, and as an alternative passing the mixed gases through it after leaving the coal gas retort, the water gas being admitted at the back end of the coal gas retort in each case, it was decided that the best way of working was to pass the water gas directly into the mouthpiece, and allow it to mix with the coal gas in the ascension-pipe. It will be observed that the process consists essentially of diluting the rich gases produced during the first half of the charge,

* Vol. XXIV., p. 544, *et seq.*

with water gas. By this means, it is claimed that an increase of 50 per cent. in volume is obtained without loss of quality. A ton of bituminous coal mixed with 10 per cent. of Albertite cannel, which by the usual process yields about 9300 cubic feet of 18 to 20 candle gas per ton, by this treatment yields 14,200 cubic feet of gas of similar candle power. Each bench of three produces 15,000 to 18,000 cubic feet of gas per 24 hours, showing an increase of at least 7000 cubic feet on the quantity of gas that would be obtained from the coal used in the lower retorts by the ordinary way, and which consists of water gas and vapours that would otherwise find their way to the tar well. The production of tar is put at 9 gallons per ton, against something more than 11 gallons by the usual process; and therefore more than 2 gallons of tar per ton of coal are converted into gas. The coke produced by the lower retorts, when good caking coals were used, was quite sufficient to supply the furnace; but if cannels were used exclusively, a supply of fuel from some extraneous source would be necessary. The experiments tried by the authors were restricted chiefly to caking coals, together with 5 to 20 per cent. of various enriching materials, as generally used in the United States. But some attention had also been given to the Peytona cannel, which yielded 10,000 cubic feet of 42-candle, or 13,200 of 32-candle gas, per ton by ordinary methods, and 22,400 cubic feet of 23-candle gas by the Gwynne-Harris process. Full details of the arrangements carried out during the experiments are given. The various experiments upon different kinds of materials are recorded at great length; and the results are summarized in a table, showing a gain of from 31 to 124 per cent. in the quantity of gas obtained, as compared with the ordinary process, besides a considerable gain in quality.

Attention is next directed to the cost of working the process. In addition to consuming all the coke, and about 25 per cent. of the tar, this process requires about 8 lbs. of anthracite per 1000 cubic feet of gas, besides the steam. By careful working, it was found that the consumption of anthracite could be reduced to little more than 6 lbs. per 1000 cubic feet of gas. The steam required was about 3500 cubic feet per bench; and about 16 lbs. of fuel would be required to evaporate this quantity, or (say) 1 lb. per 1000 cubic feet of gas produced. The anthracite retorts are opened once every 24 hours, and the contents pushed back; a sufficient quantity being added at the same time to make up for that used. The authors enter into a somewhat elaborate argument with a view of showing that the cost of labour is less with this process than with ordinary dry distillation. But this calculation is not made on the actual results of the experiments. It is based on an assumed application of the system to five benches of five retorts each; in which case two retorts would be used for water gas and the other three for coal gas, in each bench. This assumed case is also used as a medium for getting at the cost, which is put at about 3d. per 1000 feet for the pure water gas. A very elaborate series of trials as to the permanence of the Gwynne-Harris gas under the influence of cold, as compared with ordinary gas, showed a marked advantage in favour of the former. When reduced to a temperature a few degrees below zero, it lost less than 10 per cent of its value, whereas ordinary gas lost about one-third. The author's researches on the subject of the ammoniacal liquor were of a remarkable character, and led to the conclusion that the Gwynne-Harris liquor possessed wonderful properties. No scrubber or washer was used with this process, yet the gas was practically free from ammonia, and at the same time a strong liquor, thoroughly saturated with carbonic acid, was obtained. This is accounted for by the supposition that the presence of an unusually large proportion of carbonic acid, together with some excess of steam, secures the precipitation of the ammonia and the fixing of the same as carbonate in the hydraulic foul main and condensers. The sulphur compounds showed a correspondingly obliging disposition, and did not obtrude themselves to the extent of more than from 1·7 to 4 grains per 100 cubic feet. After this it is superfluous to say that the gas contained no bisulphide of carbon. As to carbonic acid, it was claimed that the greater part of it was removed by the ammoniacal liquour, so that its entire absence from the purified gas was easily secured with a very moderate consumption of lime, not greatly exceeding that used in the ordinary process. This is especially remarkable, as the analytical results show that there was sometimes as much as 13 per cent. of carbonic acid to be dealt with. The composition of the gas and the tar is investigated; and the report concludes with a summary of the advantages claimed to be established by the evidence set forth in it, as obtainable by the medium of the Gwynne-Harris process.

About this period, the attention of the late Mr. R. P. Spice had been directed to water gas, and he gave an account of his researches on the subject at the 1875 meeting of the British Association of Gas Managers.* He soon found that water gas was an admirable carrier of hydrocarbons, the carburetted product being more permanent in its nature as regards illuminating power than coal gas of equal quality; but the first difficulty that arose was the rapid destruction of the pipes and retorts by the steam. Ordinary ¾-inch wrought-iron pipes were destroyed in a week; and the retorts with little less rapidity. This led him to resolve to discard horizontal retorts in favour of vertical ones, and to work at lower heats. The retorts in common use in the shale-oil districts of Scotland for the production of shale oil, were admirably suited to his purpose. The next consideration was the best plan of introducing the steam, and also of taking off the gas. He decided to bring the steam in at the top of the retort, and to carry it—by means of a worm tube inside the retort—nearly to the bottom before allowing it to escape, and to take the gas off at the top. This proved a satisfactory plan. With horizontal retorts, the coke shrank as soon as it was heated, and the steam would escape over the surface; so that the result was a large quantity of steam and but little gas. But in the vertical retorts the steam could not get away in this manner. It was bound to pass up through the column of carbonaceous matter with which the retort was charged, so he was able to get a gas free from water, and without corrosive action on the pipes or retorts. He exhibited and described a model of his apparatus, which was heated by a slow-combustion furnace fired with breeze. The material used in the retorts was also breeze. No coke at all was used, and after twelve months' experience with the apparatus he found that he could produce water gas at a cost not exceeding 6d. per 1000 cubic feet. Each retort would yield 10,000 to 12,000 cubic feet of gas per diem; and a great advantage was that the rate of manufacture could be varied within wide limits, simply by adjusting the steam supply. In order to make the gas luminous he used petroleum. Taking the cost of the hydrocarbon at 8d. per gallon, the expense of converting the non-luminous water gas into good 16-candle gas was 1s. per 1000 cubic feet. After various difficulties due to variation in the quality and specific gravity of the spirit, he decided that the best plan of working was to pass the hot gas directly into the spirit. By this plan the petroleum was readily vaporized and taken up, with the exception of a residuum of an oily nature. This oil was admitted into the retorts, where it was decomposed, so that there was no waste whatever, and the whole of the spirit was converted into gas. In reply to a question as to the practicability of preserving a uniform illuminating power, Mr. Spice said that he had entirely overcome all difficulties, by making a rich gas in the first place, and diluting it with uncarburetted water gas, or poor coal gas, to the desired standard. On his system he could send gas of 25 or 30 candle power through any length of main, without any deposit, quite as freely as coal gas. His water gas would mix instantaneously with coal gas; but if he diluted the rich carburetted water gas with the crude water gas, some little time had to be allowed for mixture.

* See JOURNAL, Vol. XXVI., p. 27.

SPECIAL importance attaches to Messrs. Edwin Fox and Bousfield's periodical sale of shares on Thursday next, from the fact that it includes the issue, in 100 lots, of £20,000 debenture stock "B" in the New River, bearing interest at 4 per cent. The miscellaneous shares include, as will be seen by our advertisement columns, some of those of the Dartford Gas, Epsom and Ewell Gas, and Northfleet and Greenhithe Gas Companies.

A NEW form of sight-feed lubricator, the invention of Mr. Fairbairn, which is being manufactured by the Woodhouse and Rawson Electric Supply Company, Limited, possesses certain advantages, as compared with other appliances of a like character, to which the attention of our readers may be usefully directed. First, its simplicity. It consists merely of a cylindrical cup, in which works a piston bearing a rod projecting through the cover, having at the side a glass tube containing water. Next, its applicability to any bearing or other working surface; there being no necessity for fixing it to a steam-pipe. The piston rests upon the oil in the cup; and the position of the rod above the cup clearly indicates to an attendant at a distance the quantity of oil contained in the lubricator. By means of an adjustment screw at the bottom of the cup, any desired number of drops of oil per minute are allowed to float up through the water in the glass tube, from the surface of which the oil passes down a small metal pipe to the stem below, and thence to the spot to be lubricated. The same firm are manufacturing a convenient form of filter—the "Diamond"—for purifying refuse oil. This appliance can be used for cleansing animal, vegetable, or mineral oil, or glycerine, without requiring changes of the filtering material more frequently than five or six times in the course of a year, and then it can easily be done by an ordinary mechanic.

USERS of pumps will find a great deal of valuable information in regard to these appliances in the little book on "Pumps and Pumping" which has been written by Mr. M. Powis Bale, M.I.M.E., Assoc. M. Inst. C.E., and published by Messrs. Crosby Lockwood and Son. The work does not contain elaborate descriptions of the various kinds of pumps now in use; but is simply a collection of notes on their selection, construction, and management, for the use of practical men. The matter is arranged in the form of headed paragraphs, to facilitate reference; and the subject of each is dealt with as concisely as possible. In fact, condensation rather than diffuseness has been the author's aim throughout; yet he does not seem to have omitted anything likely to be of use to the class of readers for whom his book is intended. With regard to pumps employed in gas-works, the author says that those used for lifting tar should have a long stroke; have barrel, passages, and pipes as large and free as practicable, without bends and angles; and run as slowly as possible. If tar and liquor have to be lifted at the same time, two pumps, with a single steam cylinder placed between them and working both, would appear to be the best arrangement. There are only nine chapters in all; the last consisting of a number of rules and notes relating to pumps, and formulæ for aiding calculations. The appearance of the letterpress throughout shows care on the part of the printers; and the co-operation of the binder has resulted in the production of a neat little book.

Technical Record.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Dunfermline.

The Twenty-eighth Annual General Meeting of this Association was held in St. Margaret's Hall, Dunfermline, last Thursday—Mr. George R. Hislop, of Paisley (the President), in the chair. There was a large gathering of members and associates.

The President having briefly welcomed the members, the business was proceeded with.

Report of the Committee.

The Secretary (Mr. R. S. Carlow, of Arbroath) read the fifth annual report in the form agreed upon at the 1885 meeting. It was stated therein, with reference to the remit to Mr. W. Young, of Peebles, along with a Special Sub-Committee, to investigate into the question of the purification of gas in closed vessels, that the Committee regretted that, owing to a request by Mr. Young that the investigations should stand in abeyance, the Committee had not had an opportunity of making the investigations; and they recommended that the Committee should be requested to continue in office for another year. Proposals by the members would be considered by the Committee, and reported upon in due time. The benefit fund had only been drawn upon to the extent of £5, as against £20 in the previous year. The Statistical Report for 1888 was compiled and issued to the members, as well as to those who gave the necessary information. The annual report of the proceedings for 1888 was published and sent to each member of the Association. Subscriptions to the Murdoch Memorial Fund amounted to £15 8s. during the year. The fund now amounted to £301 15s. 3d.; and members were requested to give their opinion as to the best means of applying this sum for the object in view. There was no definite recommendation by the Committee; but, as an indication of the disposal of the funds, the following were mentioned:—(1) A bursary or scholarship, (2) a medal, (3) a monument, or (4) a tablet in Westminster Abbey. It was expected that when the pamphlet on Murdoch's life and work (written by a descendant of the great benefactor) was issued, a more widely-spread interest in the projected memorial would result. The Committee referred to the gratifying fact that a number of gentlemen were applying for admission into the Association; thus showing that it was accomplishing the end for which it was originated.

Murdoch Memorial Fund.

The Treasurer's statement as to the Murdoch Memorial Fund was then presented, from which it appeared that the Marquis of Lothian had during the year subscribed £10; Mr. W. J. Barbour, £2 2s.; and Sir J. Colquhoun, of Luss, £2.

Roll of the Association.

A list of names was next submitted of gentlemen whose connection with the Association had ceased by resignation, death, or default; and it was announced by the Secretary that the membership stood as follows:—Ordinary members, 156; extra-ordinary members, 56; associates, 13; honorary members, 3—total, 228. To these were added the following members, admitted at the meeting; raising the total to 237:—

ORDINARY MEMBERS.

Gibb, J.	Blantyre.
Law, W.	Gorebridge.
Malam, G.	Dumfries.
Scott, W.	East Kilbride.
Terrace, A.	Lasswade.

EXTRA-ORDINARY MEMBERS.

Dobbie, J.	Leith.
Goldie, J.	Glasgow.

ASSOCIATES.

Kincaid, J.	Dumbarton.
Whyte, W.	Kirkcaldy.

Mr. T. Whimster (Perth) asked why the name of Mr. John Reid, of Leith, which appeared in the list of resignations, had dropped out.

The Secretary explained that Mr. Reid wrote to him some time ago stating that he was now an old man, and unable to take the same active interest in the Association as he was wont to do, and asking him, reluctantly, to lay a letter before the Committee, stating his desire to resign his connection with the Association. Both Mr. J. K. Watson, of Edinburgh (whose name was also in the list), and Mr. Reid wished to resign on account of old age.

Mr. Whimster moved that Mr. Reid, who was one of the first gas managers to connect himself with the Association, and had assisted them in every way, having also occupied the President's chair, should be put upon the list of honorary members.

Mr. A. MacPherson (Kirkcaldy) seconded the motion.

Mr. J. M'Gilchrist (Dumbarton) questioned if the meeting had the power to do this.

A discussion took place on the matter.

The President gave it as his opinion that the rule requiring proposals to elect honorary members should come from the Committee referred to new members, and not to the transfer of a member from one class to another. He added that it would be very unfortunate if they allowed Mr. Reid's name to drop; and, if they were all agreed, they should retain him as an honorary member.

Ultimately, a suggestion by the Secretary was adopted, that the Committee should add to their report a recommendation that Mr. Reid should be made an honorary member.

On the suggestion of a member, the name of Mr. J. K. Watson was added; and both gentlemen were elected honorary members.

The Late Dr. Wallace.

The President said it was with feelings of profound regret that he had to refer to the death of their esteemed friend Dr. Wallace. He was sure the members all felt the loss of that gentleman very much indeed. Dr. Wallace was ready on every occasion to contribute a paper on any subject that might be of interest to the Association; and he (the President) was sure they would all feel that his presence amongst them would be very much missed. He proposed that they should send an excerpt from the minutes of that meeting to Mrs. Wallace, expressing their profound regret, and their sense of the loss they had sustained in the removal of Dr. Wallace.

This proposition was unanimously agreed to.

Comments upon the Report.

The President said it would be observed from the report that the Committee had not been able to do anything in the matter of Mr. Young's process of purification. He had signified, at the beginning of the year, that he desired it might be permitted to rest for a time. It was to be hoped, however, that Mr. Young would allow the Committee to prosecute this matter; but, in the meantime, they must await his further communications on the subject. The Murdoch Memorial was making progress; and the Committee in charge of it were very zealous in carrying on the work. He trusted they would be able to collect a sum of money which would make the memorial worthy of them. Different objects had been suggested; but he supposed the Committee would be very much guided by the amount of money they were able to raise as to what should be the form of the memorial.

Auditor's Report.

Mr. D. Bruce Peebles (Edinburgh), the Auditor, reported that he had examined the accounts for the past year, and had found them to be correct. The annual subscriptions to the General Fund amounted to £62 17s.; and to the Benevolent Fund to £25 5s. The General Fund now amounted to £112 9s. 5d.—a surplus of £2 4s. 7d.; the Benevolent Fund to £196 7s. 11d.; and the Research and Investigation Fund to £80 7s. 3d. He said he had to express his pleasure at the way in which the books were kept. There was one matter to which he might call attention—viz., the arrears, which he considered might be brought down a little. They stood at £16 14s. 6d.; and he thought it a great pity that there should be, as it were, a sort of "black list" in the Association.

The Secretary's Remuneration.

Mr. W. Key (Tradeston, Glasgow) started a discussion on the amount paid to the Secretary for his services; and expressed the opinion that many an able member would feel highly honoured by having the appointment without remuneration.

Mr. A. Smith (Aberdeen) said it was he who moved that the remuneration should be fixed at its present amount; and he thought it very small.

Mr. Peebles said he had looked through the books, and also considered the amount was small.

In the course of further remarks, it was stated that Mr. Carlow was actually out of pocket by holding the appointment, inasmuch as he had to employ a lad almost exclusively on the work of the Association.

Mr. Key expressed regret for having introduced the matter, and it dropped.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—It now falls to me to deliver to you the usual conventional introductory address, upon the threshold of which, however, feelings of gratitude naturally dictate to me an expression of sincere thanks for the honour you have conferred upon me in having once more, and for the third time, called upon me to fill the presidential chair, however much I wish that the responsibility had devolved upon me at a time when I could have given more attention to the interests of the Association.

It must be satisfactory to us, as an Association, that we continue to exist as a healthy and united body (progenitor as this is of the now great family of the gas association race); while our distinguished offspring in the South has been, by strife and strategy of opposing factions, sadly crippled. Valuing our own position, we all, I feel sure, join with others in expressing sincere regret at the rupture which has so disintegrated the concrete body of The Gas Institute, and, at the same time, our desire to see reconciliation and harmony restored, and that speedily.

Never more, perhaps, than at the present moment has unity of action on the part of the members of our profession been more essential. In the march of science, we are confronted in close succession with new inventions, ideas, and theories, having for their aim the overthrow or extinction of what has proved to be one of the greatest discoveries that the world has ever known. The application of gas resulting from the destructive distillation of coal for the purposes of giving light and heat to our dwellings, must seem to all to bear upon it the indelible stamp of divine purpose and adaptation to human needs; and the facts and experiences of to-day need not shake our belief in the soundness of gas undertakings, and the positions which these occupy in relation to all other rival concerns whatever on the face of the earth. At the same time, however, the gas manager cannot afford to sit with folded hands; and as for his feet, he must be constantly pacing

the watch-towers of science. He must, in a word, keep abreast of the flood of patents bearing upon his profession which constantly flow through the Patent Office, and which seems to be gaining both in volume and force as time goes on. The Education Act in this country is producing what free education has done, and is doing, in America—viz., a higher standard of intelligence, which, cultured by technical training, finds expression in the patent records of the country. The gas engineer and manager of the present day must be able to scrutinize and dissect, chemically and physically, every discovery, invention, or improvement that may from time to time come under his notice; and, indeed, only then can he know where he is, or what he is doing, or what is his position in the great field of science.

It is not my purpose to review very closely all that has come to the surface during the past year, since to do so would be simply repeating what has been done, again and again, at similar meetings elsewhere; but rather confine myself to certain practical considerations which are involved in our every-day duties. And I may here say, first, in reference to our old friend "King Coal," that it was my intention to present to you the results of some original investigations upon the effects of water in coal—showing how and to what extent the whole process of manufacture is influenced by its presence; but lack of time alone has rendered accomplishment impossible.

The selection of coal to secure the most favourable results possesses greater importance than is in most cases attached to it; and, next to the power of maintaining high heats for effective and economical distillation, this is a secret of success or otherwise with all gas undertakings. The presence of an excess quantity of water in a coal is a most fruitful source of annoyance and vexation, on account of diminished production, due to lowered temperature in the retorts, suddenly produced by the generation of steam from the water contained in the coal. The abstraction of so much of the carbon of the gaseous hydrocarbons, its union with the oxygen of the decomposed steam, and the production of carbonic oxide and carbonic acid—the former a diluent, and the latter an impurity to be removed by the scrubbers and purifiers—are some of the evils only; and there are besides several others too numerous to mention here. The use of wet coal is thus, without doubt, a direct method of making coal gas and water gas simultaneously. The remedy for this is, to a considerable extent at least, increased storeage accommodation, if not some system of drying the coal before use, such as was proposed by Mr. Henry Aitken, of Falkirk. There is certainly nothing more sure than that a liberal storeage will, on this account, as well as upon other important considerations, yield a liberal return upon the money invested.

In no degree can we rank as second in importance to dry coal the maintenance of high heats upon the retorts employed in the manufacture of cannel gas, particularly for coal yielding gas of average volume and an illuminating power of 25 candles and upwards. Without such heats as a means of fixing the volatile hydrocarbons, a very considerable proportion of them are condensed and run into the tar-well; and thus, in many cases, become a lost product, unless where such products are utilized on the premises, and thus partially recovered. Hence it is that the science of the adjustment of the temperature to the nature or richness of the coal employed must be regarded as one of the first principles in the education of a gas manager. As a means of securing and regulating such temperature, the scientific method of gasifying the fuel in a producer or generator, together with regenerators, secures to all who may adopt them an immense advantage over the old irregular and expensive methods of heating; since, while requiring little more than one-third the quantity of fuel for the same work, there is a saving of retort power of 25 per cent. To-day we are to hear something of a new departure in the form of a modification of such systems. Various modifications of the old system have already been made, aiming at greater economy in fuel; but in no case can they be compared with the more perfect generator and regenerator systems. No doubt, however, many small companies are averse to expending the amount necessary for the complete arrangement, and are therefore ready to adopt anything that may effect an improvement, if only to the extent of one-half. At the same time, the market value of the residual coke must be the controlling element in the consideration and adoption of a partial or full regenerative system, since, on this score alone, the difference in cost between the partial and complete arrangement may be paid off in the course of one year. Moreover, the facilities offered for stopping and resuming work without loss of fuel or heat are worthy of special consideration. These are points, however, that gas managers, as a rule, will not be slow to find out, each for himself.

Next in order, and by natural sequence, I cannot omit reference to another very important section of the science of gas manufacture, which in recent years has been receiving some share of attention, although certainly not to the extent it deserves. I refer to the combination of coals yielding gas of high and low photogenic power (such as first and second class cannels) with splint coals; the latter being, as a rule, little, if at all, inferior to the majority of third-class cannel coals in the market for gas manufacturing purposes. If, for instance, we mix in equal proportions a cannel coal yielding an average volume of (say) 10,600 cubic feet of 30-candle gas with a splint coal yielding 10,000 cubic feet of 20-candle gas, we shall, instead of getting the mean of these figures, obtain an advance upon them of something like 4 per cent. after making allowance for the diminished product of tar per ton. Whenever practicable, therefore, advantage will be gained by combining rich and poor coal, in whatever proportion may be necessary to produce gas of the quality desired, before charging the same into the retorts.

However much skilful attention may be given to the operations of the retort-house, the gain then secured may be more than lost if special care and attention be not paid to the conditions of temperature in the process of condensation, scrubbing, and purification. Claim cannot be made to conformity with modern science in gas manufacture without the means of determining the temperature of the passing gas at the various stages of the process—from the inlet of the condensers to the purifiers and the station meter. I need scarcely point out that the practice of observing the temperature at the outlet of the condensers only may in many cases prove a very misleading mode of observation, for the reason that between the condensers and the outlet of the last scrubber as much as from 5° to 25° may be lost. Hence the last-named point, or the entrance to the purifiers, is unquestionably the position where temperature ought to be carefully noted at short intervals during both day and night, and particularly in winter. Indeed, I have long held the opinion that the deposition of naphthalene in the pipes between the scrubbers and gasholders, as experienced by our English brethren, is entirely attributable to the undue reduction of temperature; and that were the latter steadily maintained at between 55° and 62° at the entrance to the purifiers, all naphthalene troubles would disappear. No doubt some will offer objection to this theory, declaring that observations (so far as made) do not support it. But it must be remembered that it is not necessary to maintain a low temperature for any great length of time to get the naphthalene deposits; on the contrary, an undue reduction at intervals of (say) 24 hours, or during night, when the temperature of the atmosphere is at the lowest, would in course of time close the pipes by naphthalene. Apart, however, from this troublesome result, experience points to the very great importance of maintaining the temperature at the outlet of the scrubbers or the inlet of the purifiers (and that in the case of English and Scotch gas-works alike) between 55° and 62°; and to secure this, no better means can be found than that of a permanent supply of hot water, connected for immediate application when wanted, both at condensers and scrubbers. In this way the temperature of the whole of the water entering the scrubbers, either directly from the mains or being returned by the pumps, ought to be heated to the required extent. Indeed, without such precautions, I have found 27-candle gas at 60° reduced 2 candles by a reduction of temperature to 32°, and the difference presented, through the "dreep" pumps, in the form of liquid hydrocarbons.

In the matter of purification, we have now before us the means of permanently revivifying oxide of iron in the purifiers—first, by the admission of such a measured volume of common air as shall contain the necessary percentage of oxygen for separating and fixing the sulphur; and, secondly, by the employment of pure oxygen gas, such as that now supplied by Brin's Oxygen Company, and at the remarkably low rate of from 2s. 6d. to 2s. 9d. per 1000 cubic feet. Mr. Armitage, of Lancaster, proposes to produce by electrolysis, the necessary oxygen from water, one gallon of which will yield 100 cubic feet of oxygen and 200 cubic feet of hydrogen. And if ½ per cent. of oxygen be sufficient, according to Mr. Valon's showing, to fix the sulphur compounds in the purifying materials, 1 gallon of water will supply oxygen for 2 tons of coal. This process has yet to be tried, however, in order to prove its utility. The saving effected by the adoption of one or other of these systems must be considerable; obviating, as they do, the necessity for changing the oxide purifiers oftener than once for every eight to twelve required under the old system. In addition to this, there will be an economy in revivifying-floor surface; and where lime is used in conjunction, the whole of the sulphur may be completely discharged therefrom, and sent forward to the last or oxide purifiers, and thus secure a pure carbonate of lime absolutely free from smell, capable of being recovered *ad infinitum*, while the entire sulphur will be saved—a most valuable result in my estimation, since I can have no sympathy with any process of gas purification that involves the sacrifice or loss of any portion of the sulphur abstracted in the purifiers. Consequently, with these recent additions to the science of gas purification, I fail to see how anything more admirable, reliable, and efficacious can ever be invented. The only reforms necessary, in my opinion, to render such arrangements absolutely perfect, are first, a more liberal coefficient of area per 1000 cubic feet passed through the purifiers per day; and, secondly, the passage of the gas downwards through all purifying material (and especially lime) instead of up through it. With regard to the first, experience has demonstrated the importance of securing not less than 3 square feet of purifier area per 1000 cubic feet per 24 hours, and that, in the purifiers in permanent operation, reduction of velocity must be regarded as the grand factor in determining area, and securing effective and economical purification. The interest upon the extra capital involved forms but a small proportion of the saving effected; but no doubt the paper we are to listen to to-day will touch upon this subject. As to the second—viz., the passage of the gas downwards through the purifying materials, instead of up through them, and especially in the case of lime—it offers a decided advantage over the present or reverse system. Having rigidly adhered to this plan for many years, I have during that period had no experience of high pressure; the greatest resistance found in any purifier being about 1 inch of water pressure, while the average may be set down at 6-10ths. It is a well-known fact that grids occupy from two-thirds to three-fourths of the entire area

of the purifiers, and when the gas, charged with carbonic acid, enters the reduced surface of the lime, the lime is immediately carbonated, and thereby rendered hard, and more or less impervious to the gas, which frequently gives rise to serious inconvenience from high pressure and blowing of seals; whereas with the gas entering at the top, and passing down through the lime, the entire area of the purifier is presented for the reception of the gas, instead of the proportion of area already stated. Moreover, should the surface ever get hard, the difficulty may be overcome in a few minutes by removing the cover and breaking up the surface. In admitting the gas at the bottom, however, nothing short of changing the purifiers to the bottom would cure the mischief; and this generally happens while as yet the lime has not been half spent.

I now pass on to gasholders, and notice a new departure in their construction, and in that of the tanks to contain them. The spiral form of guiding a gasholder, as invented by Mr. Gadd, is no doubt novel and ingenious; at the same time I should be very slow to entertain the adoption of such a form of guiding, owing to the probability of jamming, or accident to any of the spiral rollers. A few practical examples, however, may dispel prejudice; but, in my opinion, the improved modern systems of guiding leave little to be desired in this direction. Before quitting the subject of gasholders, it may not be considered out of place to refer to what must be universally acknowledged as a very critical period in the early history, or inauguration, of every gasholder—namely, the filling of the same with gas while the holder, to begin with, contains so many thousand cubic feet of air; thus producing, in the first instance, a highly explosive mixture—the mixing process, owing to a considerable difference in gravity, being not only slow but irregular throughout. The question of how best to get quit of such air has been frequently discussed, and various methods have been adopted to overcome the difficulty, and secure a gas of the illuminating power usually supplied—such as filling the holder full, and blowing off, at the bottom, the stratum of air which, in virtue of its higher density, is supposed to lie at the bottom or upon the surface of the water; or that of blowing off the air at a manhole or cock in the crown, while gas is passed into the holder through the ordinary inlet-pipes. Now, when one performs some deed of personal daring, it is sometimes characterized as tempting, or courting Providence to frustrate his designs, and consign him to destruction. But a more daring and tempting performance than that of so inaugurating a gasholder it is impossible to conceive; since, by a variety of means, from a tobacco-pipe to a passing engine, the explosive compound may be fired back, when not only the holder and guide-framing, but much surrounding property, would be destroyed, to say nothing of possible loss of life. Indeed, the practice of blowing off a mixture of gas and air anywhere, unless from the mains for the public supply, ought to be deprecated. The air difficulty with gasholders is simply and economically overcome by filling the holder with a gas of such higher quality as may be found by calculation to be necessary to neutralize the deteriorating effect of the common air contained in the holder at the time of filling. In carrying out this arrangement, the overflow from the tank should be closed, and the tank filled to the lip, so as to reduce the volume of air inside to the lowest possible quantity. Having found, by calculation, the volume of air left in the raised crown to be (say) 2500 cubic feet, while the quantity necessary to fill the holder is 50,000 cubic feet, and supposing the quality of gas supplied to be 27 candles, then, as every single per cent. of air will lower the illuminating power 6 per cent., it follows that $2500 \div 50{,}000 = 5$ per cent. of air; and multiplying this by 6, we have a total reduction of 30 per cent. on the 50,000 cubic feet—thus reducing the illuminating power to 18·9 candles, or a loss of 8·1 candles. To recover this loss, it will be found necessary only to introduce 50,000 cubic feet of $27 + 8{\cdot}1$ (or equal to 35·1) candle gas to raise the value of the whole to 27 candles approximately; in this way avoiding all trouble or risk whatever. It will thus be seen how very insignificant is the cost of effecting all this. Say the difference in cost of 5 tons of coal giving 10,000 cubic feet of 27-candle gas, and the same quantity of another giving 35·1 candles, is 6s. per ton, the whole cost of the venture will amount to 30s.; but if shale be substituted for the rich cannel, this may be reduced by one-half.

It must be gratifying to all that the market value of tar and liquor products is now year by year advancing, and that there is prospect of still further advances. The Dinsmore process of utilizing the tar, the adoption of which, under certain circumstances, must prove an economy, will no doubt, if introduced to any extent, have the effect of raising the value of tar generally—a result which we shall all hail with satisfaction.

The labour question in the Metropolitan gas-works has of late been occupying the public mind; and the adoption of the eight-hour-shift system seems to have dissolved all differences. At the same time, it yet remains to be clearly shown wherein lie the advantages of the eight-hour system, as compared with the twelve-hour shift, unless the substitution be taken to be synonymous with an advance in wages, since, in many cases, it may be found difficult to perform the work of twelve hours within the limits of eight; but where this is practicable, the subject is one that may be fairly left to the workmen themselves, as has been done in the Metropolis and elsewhere.

As being akin to this subject, the cessation of Sunday labour in gas-works will receive some attention to-day; and I trust not only that some good impressions may be produced, but that they may be of an enduring character.

From the other papers to be submitted—on "Pipe Laying," "Selling Gas," and "Sulphur in Oils"—we are sure to get some useful hints; and therefore I bespeak for all the authors an appreciative and attentive hearing, together with a liberal discussion upon the merits of each paper.

All the papers upon our card deal with matters connected with our every-day work and experience; but no reference is made to a new enterprise upon which many of us are destined very shortly to embark, as even now the characteristic "bizz" of the electric generator is loud in our ears, and to some it may sound like a war-cry or challenge to combat. But let us calmly consider the situation, and I think we shall see it to be our duty to hail electric light as another triumph of human ingenuity and progress, and therefore worthy of our recognition; and while expressing (as at the outset) our belief in the invulnerable position of gas as a lighting and heating agent, we accept electric light as a handmaid to it. Moreover, our mission is ostensibly that of producing and distributing light, heat, and comfort, not only to all human dwellings, but to the dark streets, lanes, and alleys of our towns and cities. Whether, therefore, this be in the form of gas, electric, or any other kind of light, so long as it is the choice of the public it need not much trouble us; and especially when we consider the fact that in furnishing whichever the public taste may demand, or their means command, gas companies or corporations will not be asked, as they could not be expected, to supply any such unless at a profit, and to secure which certain rules are laid down by the Board of Trade.

In virtue of the powers invested in them, the various electric light companies have (one or other of them, at least) recently served notices upon the local authorities of all the principal towns and cities in the United Kingdom, to the effect that they intend to apply to the Board of Trade for an Order to supply the same with electricity, unless good cause can be shown why they ought not to obtain such an Order; and, as set forth in the Act, such "good cause" must consist absolutely in undertaking the obligation or duty themselves. Apart from other considerations, the "*pro bono publico*" policy must be accepted, since it would be exceedingly unwise to allow a strange company to enter a town or city, invested, as it would be, with full powers to open up streets and generally carry on and push its business. The Act justly secures to all local authorities the privilege of accepting or rejecting the responsibility of supply; and, consequently, in some cases they may enter into competition with the local gas company. But, failing such interference, the Board of Trade will, no doubt, favour such a company, by securing to it the supply of electricity, and possibly also to unincorporated companies, and especially to those who may manifest any fair amount of zeal in their promise to fulfil the requirements of the Act, and obey the injunctions of the Board of Trade, who have secured to themselves very considerable powers in dealing with the question generally. But, in particular, with the circumstances of supply, so far as it affects private enterprise, they may grant or revoke the powers conferred at any time as they may find cause—such as nonconformity with regulations, or on representation by the local authorities, on behalf of the company, that the installation will not pay. The local authority will in all cases have the advantage over private enterprise in the supply of electricity, since they are in a position to borrow money at a much lower rate than any company; and no doubt the Board of Trade will in every case favour their undertaking the supply. But the duty of every local authority (and, whom failing, the gas company) is plain—viz., to supply both gas and electricity, as is now largely done in America. Meanwhile, and by way of addition to present professional skill, let every gas manager educate himself in the principles of electrical science, and thus fit himself for all the exigencies of his position, and that without failing in energy and zeal in maintaining and demonstrating the superiority of coal and cannel gas, for the purposes of light, heat, and power, over all other rivals. No one can deny the advance which electric lighting has made during the last ten years. However many times it may be dearer than cannel gas (as it certainly is several times), it may now be said to have reached the highest point of perfection possible. Ten years ago from 70 to 75 per cent. only of the power expended could be converted into light; whereas something like 93 or 94 per cent. can now be reached, and beyond which no one, even the most sanguine electrical engineer, can admit any hope of reaching.

But we have yet another rival in the field in the form of water gas, which may claim a passing notice. I need scarcely submit to you, as a fact, that the statements regarding this gas have been seriously exaggerated, and the credulity of the capitalists of the country tampered with. Few may venture to question the statement that the results obtained at the Leeds Forge were fairly successful. But, that being so, it does not necessarily follow that the process will be equally successful elsewhere; and for certain reasons which are now well understood—such as the fact that while a weight of coke is convertible into from 30,000 to 35,000 cubic feet of gas (the former from Scotch coke, and the latter from English coke), not more than one-third can be produced as water or lighting gas, and the remaining two-thirds heating gas only, which may be utilized in the raising of steam, heating furnaces, or for metallurgical purposes generally. Now according to the showing of the promoters of the water-gas scheme, this 35,000 cubic feet can be produced at a cost of 4d. per 1000 cubic feet (not including the cost of distribution); and as it would be quite impracticable for a central supply company to sell almost any portion of the heating gas, necessitating

as it would do, a special set of main-pipes, the cost of the one-third would be, on the Scotch basis of 30,000 cubic feet (say) 4·66d. per 1000 cubic feet. But inasmuch as only one-third is available for lighting purposes, the rate per 1000 feet must necessarily be raised to 4·66d., multiplied by 3, or equal to 13·98d, and to which, if we add the cost of the magnesium comb necessary to produce incandescence—say, 3·5d. per 1000 feet—we have 17·48d. per 1000 cubic feet for a gas which of itself possesses no luminosity, is practically devoid of smell, its presence difficult to detect, and is dangerously poisonous if inhaled. Or, if employed for heating purposes, this gas possesses only one-half the heating power of common coal gas, and therefore is considerably less than half that of cannel gas. It will thus be seen that this gas cannot approach coal or cannel gas in value or efficiency.

Time will not permit reference to several other important matters which I could have wished to touch upon, and particularly in reference to distribution, and the duty of all gas manufacturers to educate their customers in the use of the best appliances, &c.

In conclusion, gentlemen, the characteristic feature of the present age is the love of discovery, invention, and research with a view to bringing to light the yet many undiscovered eternal truths which lie under the surface awaiting the time when the further development and culture of the human mind shall justify such further accessions to human knowledge. And surely the gas engineer and manager will not be found lagging behind in this march of progress. But here I must leave him; believing that he will continue to fulfil his duty in the time to come, and certainly not less faithfully and efficiently than in the past.

Mr. S. Stewart (Greenock) moved a hearty vote of thanks to the President for his address; and the motion was carried by acclamation.

Reading of Papers.

The reading of papers was then commenced. They were taken in the following order:—(1) "Notes on Main Laying," by Mr. J. M'Crae, of Dundee; (2) "A Retort-Setting for Small Works," by Mr. A. MacPherson, of Kirkcaldy; (3) "Selling Gas," by Mr. Edwards, of Napier (N.Z.), read by Mr. J. M'Gilchrist, of Dumbarton; (4) "Notes on Purifiers," by Mr. J. Hall, of St. Andrews; (5) "The Cessation of Work on Sundays," by Mr. T. D. Hall, of Montrose; (6) "The Presence of Sulphur Compounds in Illuminating Mineral Oils," by Mr. A. Bell, of Peebles. These papers are noticed in another column. They will be given in full, with the discussions, in subsequent issues of the Journal.

Election of Office-Bearers.

On the resumption of the business after the midday adjournment, the Scrutineers reported that the following gentlemen had been elected office-bearers:—

President—Samuel Stewart, Greenock.
Vice-Presidents—Robert Robertson, Bathgate; Adam Macpherson, Kirkcaldy.
Secretary and Treasurer—Robert S. Carlow, Arbroath.
Members of Committee—D. Terrace, Dawsholm, Glasgow; R. Mitchell, Edinburgh; W. Mackenzie, Dunfermline.
Auditor—D. Bruce Peebles, Edinburgh.

Mr. Stewart thanked the members for the honour they had conferred upon him.

Place of Next Meeting.

It was decided to hold the next meeting of the Association at Perth.

At the conclusion of the business, the members dined together in the City Arms Hotel; and on the following day had an excursion to Aberfoyle.

Title and Index to Vol. LIII.—The title-page and index to Vol. LIII. of the Journal (January to June, 1889) are now ready; and a copy will be forwarded post free by the Publisher on receipt of a post-card.

Mr. W. J. Dibdin on Photometry.—In another part of the Journal to-day will be found an advertisement of Mr. W. J. Dibdin's "Practical Photometry: A Guide to the Study of the Measurement of Light." As the book was only issued yesterday, we cannot do more than briefly call attention to it; leaving fuller notice for a subsequent occasion.

North of Ireland Gas Managers' Association.—The second annual meeting of this Association will take place in the Market Hall, Dundalk, on Tuesday, the 13th prox., under the presidency of Mr. W. B. Featherstone, Engineer and Manager of the gas-works in that town. The programme of the proceedings which has been issued by the Honorary Secretary (Mr. J. Whimster, of Armagh) gives promise of a profitable meeting. In addition to the Inaugural Address, three papers will be read—one on "Experience in Introducing Gas-Stoves," by Mr. W. S. Stormonth, of Coleraine; one on "Unaccounted-for Gas," by Mr. T. Frizelle, of Holywood; and one entitled "Random Notes," by Mr. A. Gibb, of Newry. A novelty will be introduced on the occasion in the shape of an open discussion, which will be started by Mr. R. Ross, of Dungannon, who will invite an expression of the views of the members on the subject of "Stopped Ascension-Pipes," in connection with which some may possibly have had unpleasant experience. At the close of the business, the members will dine together in the Queen's Arms Hotel.

Register of Patents.

Guide-Framing of Gasholders.—Cutler, S., of Milwall. No. 11,960; Aug. 18, 1888. [6d.]

This invention has for its object the construction of the guide-framing of gasholders in such a manner that it shall possess great rigidity and strength proportionate to the various strains each part may have to bear.

Fig. 1.

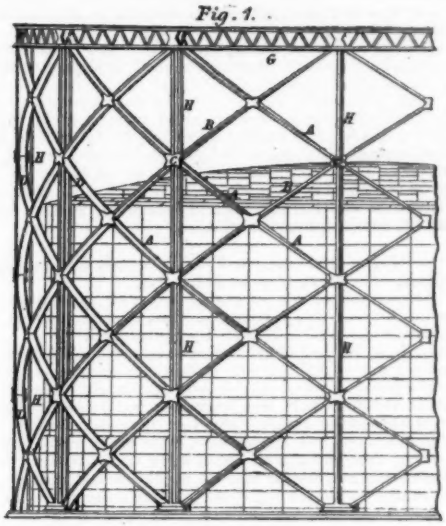
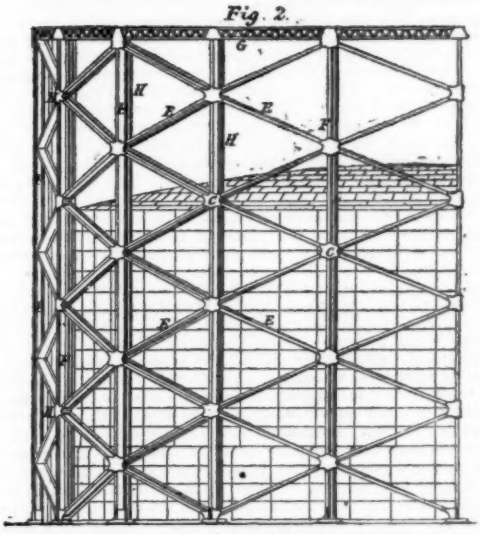


Fig. 2.



The patentee proposes to make the framing in one of two ways analogous to each other. According to the first arrangement the framing is made concentric to the gasholder, and of two or more series A and B (fig. 1) of wrought iron, steel, or other suitable metal girders, crossing and being fixed to each other at the points of intersection C. Each line of each series of girders is curved so as to partly encircle the gasholder, and in so doing to form a portion of a spiral; the broad surface of the girder (as shown at D) being placed diagonally to the horizon—the whole forming a cylindrical network of girders. In the second arrangement (as fig. 2) instead of making the framing circular in plan it is made polygonal, which having regard to economy of manufacture will (says the patentee) in many cases be preferable; each side of the polygon being formed of two or more series of straight girders E, placed diagonally to the horizon, with vertical girders F at suitable intervals.

In both arrangements the end of each line of girders is fixed at top to a special girder or girders G, preferably of box form, while the lower ends of the girders are fastened by holding-down bolts either to the tanks, piers, or other bases; or they may be secured to a girder of a similar character to that at the top, so that the holding-down bolts can be placed at more frequent intervals, and thus distribute the strain over the tank or other foundations.

The guides H, for the rollers of the gasholder, in both cases are fixed vertically to the top, bottom, and intermediate girders; and they are in some cases constructed so as to form part of the network of girders already described; but, though advantageous, this connected construction is not essential.

Igniting Apparatus for Gas-Engines.—Abel, C. D.; communicated from the Gas Motoren Fabrik Deutz, Deutz, Germany. No. 14,349; Oct. 5, 1888. [8d.]

This invention relates to igniting apparatus for gas-engines wherein the ignition of the combustible charge is effected by bringing a portion of the same at the required moment in contact with a body maintained in a state of incandescence. For this purpose there have heretofore been

used metal tubes heated externally, into the interior of which a portion of the compressed charge was admitted; but, say the patentees, such incandescent tubes, although they effect with certainty the ignition of the charges, do not insure the permanently reliable working of the engine. As these tubes have to withstand an internal pressure of about 12 atmospheres while in a state of high red heat, they must be made comparatively thick; while for the ready conduction through them of the heat from the external source, they should be made as thin as possible. Also, owing to the continual heating and oxidizing action of the external flame, the metal of the tubes becomes gradually weakened, so that fractures of the tubes frequently take place, resulting in the interruption of the working of the engine.

The present invention has mainly for its object to obviate these defects and it consists in enclosing an incandescent body in a cavity or chamber in which, at the required moment, a portion of the compressed charge is made to come into contact with all sides of the incandescent body, so that this is not subjected to any one-sided pressure; the body being maintained at the required state of incandescence by the heat produced by the combustion of the charge, without requiring any external heating. The chamber or cavity may either be formed in the side of the cylinder, or it may be contained entirely within the cylinder, so that the outer surface is not in contact with the atmosphere but receives additional heat from the combustion in the cylinder.

GENERATING WATER AND PRODUCER GAS.—Langer, J. Von, and Cooper, C., of Leeds. No. 8192; May 16, 1889. [4d.]

This invention relates to a process by means of which water gas, and producer (or Siemens) gas, is generated "in a more economical, efficient, and safer manner, than has hitherto been performed."

In the ordinary method of generating the above-named gases, say the patentees, a mass of fuel burning within a generator or producer, is alternately exposed to a blast of air (heated or otherwise) from the bottom; and a jet of steam (usually superheated) or water entering at the top. The air blast passing through the fuel from the bottom upwards, quickly heats the fuel and carries with it the gases or products of combustion of the fuel through an outlet at or near the top. When the fuel is sufficiently hot, the air blast at the bottom is shut off, and the steam is turned on at the top (thus passing through the fuel in the reverse direction); and this becoming decomposed in its downward passage through the incandescent fuel, its products are generally known as water gas. The steam quickly cools down the burning fuel, so that it is necessary to shut it off and again use the air blast to raise the fuel to the required heat for decomposing the steam; and this process, going on intermittently, in reverse directions, may be termed the intermittent reverse process for generating water gas and producer gas.

By the present invention, the air, which is usually highly heated, is admitted at the top of the generator or producer; and after passing downward through the burning fuel, mixing with the gases or products of combustion thereof, it finds one or more exits at the bottom of the generator, and is also known as producer gas. The air supply is now likewise shut off; and the steam being turned on at the top of the generator, passes downward and, becoming decomposed in its passage through the incandescent fuel, is taken off as water gas. This process, going on intermittently in the same direction, may be termed the intermittent direct process for generating water gas and producer gas.

In both cases, the fuel is put in the generator at the top; and coke or anthracite coal is almost always used. If coal of a bituminous character were used, the upper part or "green fuel," being farthest from the air blast replete with oxygen, and also first exposed to the steam or water used, would cake, and greatly obstruct the passage of both air and steam through its compacted substance. But in this invention the difficulty is said to be greatly reduced or removed altogether, so that the patentees are enabled not only to use coal, but also small or slack coal of the cheapest description. Furthermore, the highly-heated air, entering at the top, combines with the gases from the fresh fuel, and fires them; thus producing a larger mass of incandescent fuel in the generator for the steam, entering afterwards, to act upon. The result is that less producer gas and more water gas is made from the fuel, than in the usually practical process. By the latter method, more producer gas and less water gas is generated, than is generally wanted. In addition to these advantages, the time required for bringing the fuel up to the required heat is said to be reduced, and consequently more water gas passages may take place within a given time. As there are no reversals in direction of the air and the steam in this process, there is not only less chance of spaces in or about the valves, containing portions of water gas and air, to form explosive mixtures, but the free oxygen has been consumed in its passage through the fire, thereby reducing the well-known risk of exploding the water gas.

APPLICATIONS FOR LETTERS PATENT.

11,432.—C. M'K. DOWIE and BRIGGS, A. L., "Improvements in apparatus for carburetting illuminating and other gas." July 17.

11,456.—MEIKLEJOHN, N., "Improvements in anti-dips for hydraulic mains employed in the manufacture of gas." July 17.

11,459.—DHEYNE, J., NYDPRUCK, COMTE DE, and DE LA HAULT, F., "Improved apparatus for generating gas or vapour from combustible liquids." July 19.

11,498.—MICKLETHWAIT, W. H., "Improvements in the construction of gas cooking appliances." July 18.

11,518.—CLARKSEN, A. T., and SPURGE, J. B., "Duplex and other apparatus for regulating the flow of gases under pressure." July 18.

11,530.—ENWRIGHT, J., "Improvements in the manufacture of water gas and of coal gas." July 19.

11,564.—WORCESTER, F. C., "Improvements in recording cards or registers for gas and other meters." July 19.

11,622.—FERON, A., "Improvements in gas-governors." July 20.

11,624.—JONES, F. J., "Improvements in the manufacture of illuminating gas." July 20.

AT the last meeting of the Huddersfield Town Council, on the recommendation of the Gas Committee, it was resolved to make a reduction of 25 per cent. in the price of the gas used in the public lamps and in the rent charged for the meters.

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

LIBRARIES AND READING-ROOMS IN GAS-WORKS.

SIR,—From long personal experience—extending over 25 years—in gas-works, I have arrived at the conclusion that gas makers require special training to fit them for their work. Apart from physical capacity, other qualifications are absolutely needed; therefore wherever this special training is practised, good will follow, and both employer and employed be benefited. In my opinion, libraries and reading-rooms *on the works* are the best medium for this, for in them lectures, with drawings of the apparatus clearly illustrating the whole process of gas making, could be delivered; and, by way of variety, readings could also be given. Retort-house men, especially firemen and stokers, would derive great benefit from such an institution; for since the introduction of regenerator and generator furnaces and stoking machinery, more individual thought is required, and, for their successful working, a lively personal interest is necessary. Rule-of-thumb will not do at all. Your readers are aware that we have started at Dover a reading and lecture room which has been very successful.*

Too many look upon gas making as hard and disagreeable work—nothing more. This is a great mistake, which any retort-house man can prove for himself. All that is required is a wish to know more about your work. Should this wish exist, numerous details will present themselves which, if followed up, will be found both instructive and interesting.

Dover, July 24, 1889. R. HERRING.

A SIMPLE FORM OF DISTILLATION FLASK FOR THE VALUATION OF GAS LIQUOR.

SIR,—My attention has been drawn to Mr. H. Leicester Greville's interesting contribution in your issue of the 2nd inst. (p. 16). The apparatus described and figured therein can, however, hardly be called novel, inasmuch as it has been used by me for some three years; and I believe it is not unknown in some laboratories on the Continent. I can endorse all that Mr. Greville says as to the general convenience of the apparatus.

W. HEPWORTH-COLLINS, F.C.S., &c.,
Gas Examiner and Analyst to the Bolton Corporation Gas Committee.

Bolton, July 22, 1889.

OUTSIDE STOPCOCKS AND WATER-WASTE DETECTORS.

SIR,—I presume the Waste-Water Meter Company would have to employ constantly at least one inspector for a town with 30,000 or 40,000 inhabitants. If this man is able to thoroughly inspect his districts with the aid of a sounding-rod of some form, and without the aid of waste-meters, it is undoubtedly a great advantage to the water authority. I quite agree with "Night Inspector," and fail to see why such a simple arrangement should not answer in any town. The inspector must, of course, be a fairly intelligent man, and take an interest in his work; and as there are still some English workmen to be found who have both of these qualities, I see no reason why a water company should be put to the expense of waste-meters.

As to stopcocks, I agree that they are both necessary and desirable; and it appears only fair, to my mind, that the companies, if they own them, should be liable for damages caused through an imperfect and dangerous article being placed in the public thoroughfares. J. G.

London, July 26, 1889.

SIR,—As a paper which I read some time ago at a meeting of the Association of Municipal and Sanitary Engineers was misquoted in your issue for the 16th inst. by "Night Inspector," perhaps you will allow me to correct the error in your columns. What I said was this: "For the *perfect* and *most simple* working of the Deacon system, each house ought to be provided with an outside stopcock. In Leamington not more than one-sixth of the houses are so provided. Excellent results can, however, be obtained without these stopcocks." When I wrote the above, I had had but a few months' experience of the Deacon meters; having but recently adopted them. Further acquaintance with the system has shown me that it is precisely in towns where outside stopcocks do not exist that Deacon meters are most useful and most needed; and, for my own part, I would much sooner have the meters without the stopcocks, than the stopcocks without the meters, as far as detection of waste is concerned. If one is dependent on stopcocks alone for the detection of waste, he must sound every stopcock in a district to ascertain the condition of that district. Not so with Deacon meters. These not only point out where waste does exist, but also where it does not. This is most important; for it reduces immensely the time and labour of inspection. Further, the meter not only detects waste, but also indicates the exact amount in each section of the district.

By way of example, take a district of (say) 600 houses, divided by valves into twelve sections. A glance at the diagram shows a total waste of (say) 400 gallons per hour. Examination of the diagram shows this waste to consist of 150 gallons per hour in one section, of 100 gallons per hour in another, 80 gallons in a third, and 70 gallons in a fourth; whilst eight sections are shown to be free from waste. In these latter the inspector need not spend any time at all. As regards the others, take No. 1 as an example. It consists of (say) 70 houses—without the outside stopcocks—and the waste is 150 gallons per hour. The latter figures are given to the day inspector; and he, of course, only carries on his search until he has found waste to this amount. This he may do at the first hydrant he comes to, or in the first dozen houses he visits; and then his examination of this section is at an end. He proceeds in a similar way in the other three faulty sections, with the probable result that, as regards this district of twelve sections, he has altogether to inspect but half or one-third of the houses in the four faulty sections, and has been spared the time and trouble of visiting the other eight sections.

Assume now that six months have elapsed since the inspection just instanced, and that it is desirable to again ascertain the condition of the

* Some particulars of Mr. Herring's work at Dover will be found in another column.—ED. J.G.L.

district, because, for example, the total consumption in the town had increased considerably and suddenly. A night diagram is taken. The first glance may show that the condition of the district is good. Therefore no inspection at all is needed in it. Now, without the meter, every one of the 600 houses must have been inspected, either internally or (if there were outside stopcocks) externally, and at night, to ascertain this simple fact. What a saving of time and labour is here! Let us pursue our ideal suddenly increased consumption further. Diagrams are taken (without even the trouble of making sectional sheets) in the other nine districts into which the town is divided. Most of these diagrams show (say) the normal, or a but slightly increased waste; but one shows a waste increased from 400 or 500 gallons to 3000 gallons per hour. A second diagram of the district is taken at night; and the valves of the different sections are shut in rotation. The diagram indicates next day the section in which the abnormal increase of waste has taken place, and day search in that section reveals (say) a burst main or a blown joint. How simple and speedy is the discovery of this waste by the above method, as compared with any other whatsoever. In my experience of twenty months' use of the Deacon meters, I have had three such cases as the serious waste just exampled. In one the waste was 57,000 gallons per day; in the second, it was 64,000 gallons; and in the third, 38,000 gallons. In each of these instances the water was getting away invisibly underground into sewers, without the slightest indication on the surface.

W. de Normanville,
Borough and Water-Works Engineer of Leamington.

Leamington, July 22, 1889.

The Thirlmere Water-Works.—Yesterday week the members of the Manchester Corporation paid a visit to the Thirlmere works. Towards the end of June last year (as recorded in our columns at the time) an inspection was made by the Council of the aqueduct between Thirlmere and Windermere; and on the present occasion the inspection was commenced at the south end of Moor Howe tunnel, where the previous visit terminated. Some particulars of the part of the aqueduct explored by the members will be found in the Journal for April 30 last, p. 821.

Proposed Transfer of the Douglas (Isle of Man) Water-Works to the Town Commissioners.—The Douglas Town Commissioners have finally decided to purchase the property of the Douglas Water-Works Company at a price of £144,000. A proposal was made that the sum of £133,000 be offered for the works, and another motion was brought forward that the Commissioners, instead of purchasing the property, should introduce a measure into Parliament, asking power to construct works for themselves. Both proposals were rejected by large majorities.

The Divining-Rod.—A South Wales paper gave publicity last Tuesday to the following paragraph:—"Mr. Lawrence, of Bristol, has recently, at the expense of the Mayor, been making a series of experiments in Cwmdonkin Park, Swansea, with the object of indicating the presence of water there. He is described as being most successful; his rod indicating the presence of water in places where he could have had no previous knowledge of its existence. The Deputy-Surveyor (Mr. Hannaford) has written a letter to the Mayor in which he says he has tested the genuineness of Mr. Lawrence's extraordinary powers."

Extensions at the Oldham Gas-Works.—Last Wednesday week the Gas Committee of the Oldham Corporation visited the various works under their control. Having inspected the works in Greaves Street, which they found in good working order, they proceeded to the Higginshaw Station, where the attention of the members was chiefly centred on the large new gasholder tank in course of construction. The work was considered to be going on satisfactorily. The tank will be 200 feet in diameter. A new retort-bench is also to be erected, and it will contain 20 settings—10 on each side. It is expected that the latter will be ready for working next winter. The Committee, it is understood, have also ordered some new apparatus for the conveyance of the coal and cannel from the stores to the retort-house. It is believed that this apparatus will effect a considerable saving; and should it prove satisfactory, it is intended to adopt it at the other stations. After having examined the other departments, the Committee visited the Hollingwood works, where the plant was found to be in good condition.

Northern Coal Trade.—The coal trade of the North of England has been disturbed by the uncertainty as to the working of the miners of Durham after the end of this month, when the sliding scale will expire. In consequence of this, some of the coal-owners have declined to tender for contracts just now; and in other cases higher prices have been asked for Durham coal. At present, best gas coal is quoted at 8s. 6d. per ton, though it is well known that much of the coal is sold at about 6s. per ton on old contracts. A Tyneside firm has just booked the contract for the supply of the gas coal for Limerick; but the price has not yet transpired. The local demand for gas coal is only limited; but there is a fair inquiry for exportation. Steam coal is in fair request at about 9s. 6d. to 9s. 9d. per ton, free on board, for best Northumbrian qualities; and secondary kinds at from 6d. to 9d. below these prices. There is a good demand for small coal, which now commands about 4s. to 4s. 3d. per ton, free on board in the Tyne. There is a tendency just now to ask higher prices for gas coal—one of the largest collieries now quoting 9s. for best quality free on board in the Tyne. Some local gas companies are beginning to lay a little more coal into stock; thus providing against possibilities. Larger quantities of steam coal are also being laid in; so that it will be possible to manage for a short period without the full supply. It may be added that certain of the collieries not in the union will arrange to work.

Proposed New Water Scheme for Baildon.—At the meeting of the Baildon Local Board last Tuesday, Mr. Waugh originated a discussion on the question of the water supply of the township. He declared that it was high time that steps were taken to secure a comprehensive scheme of water supply for the inhabitants. They were drawing over 80,000 gallons a day out of the reservoirs, and had only 36,000 gallons running in. They ought to secure a supply that would meet all their needs for at least ten or twenty years. The Surveyor (Mr. Wiseman) stated, in answer to a question, that their present storeage would last them at the existing rate of consumption about ninety days. The Chairman said that no doubt the matter required attention; but it would be necessary to obtain an Act of Parliament. Mr. Waugh replied that an Act would not cost much, if unopposed. The members generally agreed with Mr. Waugh that an increased water supply was absolutely essential; but Mr. Ferrand urged that it would be too precipitate to seek for large powers at once. Ultimately it was resolved, on the motion of Mr. Waugh, seconded by Mr. Holmes, that the following resolution be entered upon the minute-book:—"That, in consideration of the consumption of water in the township being in excess of the supply, powers be secured for obtaining a further supply from the gathering-ground on Hawkesworth Moor."

Parliamentary Intelligence.

HOUSE OF LORDS.

Thursday, July 25.

WITHDRAWAL OF THE SMOKE ABATEMENT BILL.

Lord Stratheden and Campbell said the Bill he had introduced dealing with this subject had had the essence taken out of it by the Standing Committee to whom it had been referred. Inasmuch as the principle of the Bill had been frequently affirmed by that House, he thought the action of the Standing Committee was *ultra vires*. He had determined to withdraw the Bill, and was endeavouring, in conjunction with the Smoke Abatement Institute, of which the Duke of Westminster was Chairman, to frame a new Bill, which he expected he would be able to lay on the table during the present session.

The following further progress was made with Bills during the past week:—

Bills read the first time: Electric Lighting Provisional Orders Bills (Nos. 2, 3, 4, 5), Metropolitan Electric Supply Bill.

Bills reported: Garw Water Bill, Scarborough Improvement Bill, West Ham Gas Bill.

Bill read a second time and committed: Wigan Borough Extension Bill.

Bills read the third time, and passed: East Kent District Water Bill, Woodhall Spa Company Bill.

Bills Royal Assented: Eastbourne Water Bill, Gas and Water Orders Confirmation Bill.

HOUSE OF COMMONS.

Monday, July 22.

PRIVATE BILLS (ALTERATION OF MEMORANDUM OF ASSOCIATION).

The following members—viz., Mr. Courtney, Mr. Bristowe, Mr. Haldane, Mr. Raikes, and Sir Horace Davey—were appointed a Select Committee to join with the Committee appointed by the Upper House, (*ante*, p. 169) to consider and report under what circumstances, or upon what conditions, if any, Private Bills altering the terms of the Memorandum of Association of companies ought to be allowed to pass.

Tuesday, July 23.

ELECTRIC LIGHTING PROVISIONAL ORDERS (No. 2) BILL.

On the consideration of this Bill,

Mr. Bartley moved the following clause:—"Nothing in this Order shall affect the right of any person to supply his own premises and any houses or premises adjacent with energy." He said that gas and water companies claimed exclusive rights of supply; and it was important to take care that electric lighting companies should not be able to prevent a man lighting his own premises or those of his neighbour.

Sir M. Hicks-Beach said he had looked into the matter, and there was no doubt whatever that the provisions of the Bill would in no way interfere with or take away the rights of individuals which the honourable member referred to; and it would be competent to any person to supply his own or his neighbour's premises with the electric light, so long as he did not break up or cross the public street. Still, the insertion in this Bill of the proposed clause might be held to prejudice the rights of the Gas and Water Companies in the Metropolis.

Mr. Bartley said on this assurance he would withdraw the clause.

Mr. Baumann moved an amendment to clause 25, to reduce from three to two years the period for which local authorities were to be bound in regard to the lighting of unscheduled streets.

Sir M. Hicks-Beach accepted the amendment, and said he would see that the consequential amendments were made in another place.

The amendment was agreed to, and the Bill was read the third time.

LIGHTHOUSE ILLUMINANTS.

Mr. T. W. Russell asked the President of the Board of Trade whether he would lay upon the table of the House the further correspondence which has taken place on the subject of lighthouse illuminants (in continuation of Parliamentary Paper No. 60 of this session).

Sir M. Hicks-Beach: As a question arising out of the reports of the Trinity House on the experiments made at the South Foreland in 1884 and 1885 has been referred to a Committee of the Royal Society, the honourable member will agree with me that it will be well to wait for the report of the Committee before presenting to Parliament further papers upon this subject.

STOKERS IN THE ROYAL ARSENAL GAS-WORKS.

Mr. Cuninghame Graham asked the Secretary of State for War if he could now inform the House as to the result of his inquires in regard to the number of hours worked by the gas stokers employed by the various Gas Companies of London; if it was a fact, as had been asserted by the *Labour Elector* for July 13, that at the following gas factories—viz., East and West Greenwich, Bankside, Kent Road, Rotherhithe, Vauxhall, Fulham, King's Cross, Shoreditch, Bromley, Kensal Green, Nine Elms, Beckton, Bow Common, and Lower Sydenham—the hours had been reduced to eight per day; and whether he would now take steps to remove the discontent of the Government gas stokers, and avoid possible strikes, by reducing their hours of labour in a like degree.

Mr. Stanhope: The inquiries are not completed; and I am not prepared to accept or reject the newspaper statement quoted. I am glad to say that I am not aware of any discontent among the Government gas stokers, who know that their case is being inquired into.

Thursday, July 25.

LIGHTHOUSE ILLUMINANTS.

Dr. Cameron asked the President of the Board of Trade whether, in compliance with the memorials sent to Her Majesty's Government in several sessions of Parliament from shipowners of Glasgow, Liverpool, Newcastle-on-Tyne, and other seaports, asking for an investigation into the Trinity House report on the South Foreland experiments with lighthouse illuminants (amongst which was a memorial sent by shipowners of Glasgow to Lord Salisbury last year, signed by 59 important shipowning firms of that city, and containing the text of similar memorials from shipowners of Glasgow to the Board of Trade in 1886 and 1887, to which 20 and 43 signatures were respectively attached, all strongly urging further investigation into that report), the Board of Trade had appointed a Committee consisting of Sir George Stokes and two other members of the Royal Society to report to them on the particular point as to whether the conclusions of the Trinity House report were justified by the records of the experiments contained therein; whether the terms upon which the shipowners agreed to this reference were stated by Mr. Wigham, in a letter to the Board of Trade, to be that it should be an essential part of the reference that the Committee should receive such evidence and explanations as might be submitted to them,

with the object of elucidating his allegations and those of the shipowners; whether Mr. Wigham had formally tendered to the Committee these explanations and evidence, and what time had been fixed by the Committee to receive them; whether any steps had been taken by the Committee to make it publicly known that such evidence would be received; and whether the inquiry would be publicly conducted, so that shipowners and others interested might be present, and tender evidence should they desire to do so.

Sir M. HICKS-BEACH: After protracted correspondence, I requested the President of the Royal Society in April last to nominate, in consultation with his Council, a small Committee of that body. This he very kindly consented to do; and the reference made to them was as follows:—"Whether the conclusions of the Trinity House, as set forth in their report on lighthouse illuminants, are justified by the record of the experiments contained therein." I am not aware how far Mr. Wigham has been authorized to represent the shipowners named in the question; but he unconditionally agreed to this inquiry. It is within the discretion of the Committee to receive such evidence as they may think desirable to enable them to decide upon the points at issue. But I have no information as to what steps have been taken by the Committee; nor does it seem to me desirable or expedient that I should interfere with their discretion as to the mode in which the reference is conducted.

FRIDAY, JULY 26.

LOCAL AUTHORITIES AND ELECTRIC LIGHTING PROVISIONAL ORDERS.

Sir G. CAMPBELL asked the President of the Board of Trade whether the formal consent of the Corporation of Birmingham to the Electric Lighting Provisional Order for that town had now been received; whether in any other cases in which he had granted a Provisional Order without making a special report of the grounds on which he had dispensed with the consent of the local authority, the consent of the local authority had been formally and directly put on record; whether, in future, he would take care that, in the terms of the law, no Provisional Order is granted without the express consent of the local authority or a special report; whether he was aware that all over the country electric companies are scattering very numerous applications to light towns without any apparent minute inquiry, and rather with the object of being first in the field for concessions; and whether he would take care that local authorities are not unduly harassed or hurried in regard to applications which may not be serious, and are allowed time to look about them before they are obliged to deal with applications in the way proposed by Major Marindin.

Sir M. HICKS-BEACH: The answer to the first two paragraphs of the honourable member's question is "Yes." I will take care that the provisions of the section to which the honourable member refers are complied with. I may, however, point out that a difficulty arises from the fact that amendments are pressed upon me up to the very last moment of the issue of the Orders. I will, however, endeavour to arrange that in future either the formal consent of the local authority shall be obtained, or that a special report shall be made before the second reading of the confirming Bill. In the consideration of any future proposals which may come before me, I will certainly take care that local authorities are not unduly harassed or hurried. It is with the very object of avoiding any such hurry that Parliament has enacted that notices should be given to local authorities, on or before July 1, of all Provisional Orders applied for in respect of the ensuing session of Parliament.

The following further progress was made with Bills during the past week:—

Bills reported: Gas and Water Orders Confirmation Bill, Metropolitan Electric Supply Bill.

Bills read the third time, and passed: Electric Lighting Provisional Orders Bills (Nos. 2, 3, 4, 5), Gas and Water Orders Confirmation Bill, Metropolitan Electric Supply Bill.

HOUSE OF COMMONS COMMITTEE.

(*Before Lord* FRANCIS HERVEY, *Chairman; Sir* FREDERICK MAPPIN, *and Messrs.* ROYDEN, D. A. THOMAS, *and* BONHAM-CARTER, *Referee.*)

THURSDAY, JULY 11.

BARROW-IN-FURNESS CORPORATION WATER BILL.

This Bill came before the Committee to-day. Its object is to enable the Barrow-in-Furness Corporation to construct additional water-works, and to take water from the River Duddon. The project was initiated by the Barrow Hæmatite Steel Company, Limited, who last November served a notice on the Corporation that in future they would require 4 million gallons of water a day for manufacturing purposes, and who, after causing inquiries to be made by their Engineer as to the feasibility of the scheme, deposited a Bill to enable them to obtain a supply from the head waters of the Duddon. Not to be forestalled, the Corporation lodged a Bill embodying a practically identical scheme; and after protracted negotiations between the Corporation and the Steel Company, which contributes one-fourth of the rates of the town, the Bill promoted by the Company was withdrawn—the Corporation undertaking by an agreement forming part of the present Bill, to supply the reservoirs of the Company with 4 million gallons of water in every 24 hours so long as they are in a position to afford such a supply. The engineering features of the scheme are very simple. It is proposed to construct a weir at a point on the Duddon 17½ miles north of Barrow, and about four miles from Duddon Bridge, on the estuary of the river. The stream at this point taps a drainage area of about 12,000 acres. The weir is to be 3 feet high; and from this point the water is to be conveyed underground to Barrow in pipes 24 inches in diameter. There is a provision in the Bill that the supply to Barrow is to be cut off when the quantity of water in the stream falls below 4,500,000 gallons a day. Apart from the opposition of the Local Boards, the case of the opponents was that the proposed abstraction of the water would have a detrimental effect on the estuary of the Duddon, where certain iron companies have wharves. The petitioners against the Bill were the Cumberland Iron Mining Company, Mr. J. Dawson Newton, the Millom Local Board, the Dalton-in-Furness Local Board, Mr. James Lowther, M.P., as Trustee of the Lonsdale Estate, the Hodbarrow Mining Company, and Mr. W. Rawlinson.

Mr. PEMBER, Q.C., in opening the case on behalf of the promoters, stated the nature of the proposals in the Bill, as set forth above.

Mr. *A. H. Strongitharm*, C.E., and an Alderman of the borough, gave evidence which corroborated the learned Counsel's statements.

FRIDAY, JULY 12.

Mr. *Strongitharm* was recalled this morning, and in reply to Mr. WOOD who represented Mr. Lowther), said that the present sources of supply would not yield more than 3,000,000 gallons; and the consumption had reached 2,624,000 a day. The experience of 1887 showed that they must look elsewhere for an additional supply.

Mr. PEMBER remarked that the Corporation only proposed to take a portion of the water falling on the total area of the watershed—viz., about 4½ per cent.

Witness observed that the Corporation had always regarded the Duddon watershed as the future source of supply.

By Mr. CLIFFORD (representing the Dalton Local Board): Under the present arrangement the Steel Company paid 4d. per 1000 gallons supplied; under the new arrangement they would pay between ½d. and ¾d.

Mr. *E. Wadham*, Chairman of Committees of the Corporation, said the Steel Company was of the first importance to the welfare of the town; in fact, on this Company and a few other companies the existence of the town depended. The Corporation were on friendly terms with the Steel Company, and supplied them with water to the best of their ability. It was desirable in the interests of the borough that a further supply of water should be obtained. The Engineers advised the Corporation that the Duddon would give a good and proper supply, and that the works would do no injury to anybody interested in the waters.

Mr. *David Evans*, Manager of the Barrow Hæmatite Steel Company, deposed that the Corporation had been supplying the Company with water at the rate of 720,000 gallons a day; but the supply was not at all adequate, and the Company had had to sink wells and to use salt water. The requirements of the works he estimated at 4 million gallons a day. Everything had been done to use the water economically. The Engineer was last year instructed to look out for a separate supply. He examined various sources, and finally decided on the Duddon. The Company had determined to carry forward their Bill with that object; but the scheme was dropped on the Corporation undertaking to prosecute the present Bill.

By Mr. POPE (who also appeared for Mr. Lowther): In the first instance the Company petitioned against the Bill of the Corporation.

Mr. POPE: This is what you said: "Even if it could be shown the Corporation were in need of an additional water supply, they have for many years had statutory powers to construct additional works, and although they have been in possession of those powers for about 14 years the works have remained unexecuted. We submit it is inexpedient to confer any powers on the Corporation to construct additional works until they have completed those already authorized." Further, you say: "Except for the requirements of the Steel Company, the Corporation are not in want of any additional supply."

In further cross-examination, witness said that if the Corporation Bill were lost, the Company would still be under the necessity of going on with their Bill to obtain a fresh supply; and until the Corporation came to some agreement with them, this Bill would be kept alive.

Mr. *J. T. Smith*, a former Manager of the Hæmatite Steel Company also gave evidence in support of the Bill.

MONDAY, JULY 15.

Mr. *Fox*, the Borough Engineer of Barrow, said that in 1887 attention was called to the question of the water supply of the borough; and in November last he received instructions from the Corporation to prepare a scheme to bring water from the Duddon. The proposed catchment area was 12,000 acres in extent; and the intake would be 17½ miles from Barrow. The main pipe would be capable of discharging 5 million gallons a day. About 7¾ miles of the pipe would be laid along the roads, and 9¾ miles through private property; but of the latter length 4¾ miles would be adjacent to the railway fence. Just below the intake a low weir would be built; and between the intake and the main pipe, a settling pond would be constructed for the purpose of catching sand, and other matter in suspension. The elevation of the catchment area varied from 250 feet to 2500 feet above the sea level. The minimum rainfall over this area was 54 inches; the average, 89 inches, and the maximum, 124 inches a year. The minimum rainfall would yield, on the average, a flow of 30 million gallons a day; and of this the promoters proposed to take only 5 million gallons a day, or one-sixth of the flow. Below the intake and Duddon Bridge there was an area of 9000 acres that would be left untouched. There were no works on that portion of the river except an abandoned iron furnace and a small mill. The Fishery Board was satisfied with the offer of the Corporation to leave a minimum flow of 4,500,000 gallons, or not to take the water when the stream was below that level. In his opinion, the abstraction of the water would in no way affect the estuary of the Duddon, which was maintained firstly by the effect of the ebb, and secondly to some extent by the effect of the fresh water coming down the Duddon at flood time.

Cross-examined, witness said that the demand made by the Steel Company had no doubt rendered necessary the present application to Parliament. They were not proposing to give any compensation water, because they did not interfere with the floods. The proposal was to abstract from the stream 5 million gallons of water a day out of 30 million gallons, which was the average in the driest years. There had been complaints of the want of storeage in connection with the existing watershed and the present Bill gave them power to construct the Harlock reservoir—a power which he admitted the Corporation had possessed since 1875. Taking the period between June 7 and July 9 last, there were 21 days when the level of the Duddon was such that the Corporation would have been unable to obtain a supply from that source; and there were eleven days when they could have taken some, but not the whole of the 5 million gallons to which they were limited.

Mr. STEPHENS: You undertake by this Bill to supply the Steel Company with 4 million gallons a day?

Mr. PEMBER: We are under no such obligation. We are only required to give 4 million gallons, provided the conditions are such that we can get it.

Mr. STEPHENS: Assuming the requirements of the Company to be as stated—4 million gallons a day—the Bill does not secure what they want?

Witness: The Corporation are not bound to supply that amount; but I believe we shall be able to do it.

There are a certain number of days when you won't be able to take any water from the stream; and therefore you will owe a balance to the Company?—Yes; but the balance is not to be made up in quantities exceeding 3,500,000 gallons in one week.

So that whenever there is a balance due to the Company, the supply from the Duddon is hypothecated until that balance is made good; and the town will receive no benefit?—Of the 5 million gallons a day proposed to be taken from this source, 4 million will go to the Steel Company; and of the difference (1 million gallons) only 500,000 gallons a day will go to the Steel Company to make good a previous deficiency.

In re-examination witness said the scheme was a very simple one indeed. The problem presented to his mind was that there was water by millions of gallons ready to be obtained; and he had devised the means of securing it. If either Mr. Newton, or Mr. Rawlinson, or Lord Lonsdale's Trustees were damaged in any way, they could receive compensation under the Water-Works Clauses Act.

The CHAIRMAN said he had been considering whether the Bill really would prevent the Corporation taking all the water in the river, supposing the flow was just above 4,500,000 gallons.

Mr. PEMBER replied that if the verbiage of the Act required alteration, he was prepared to accept any suggestion from his Lordship. At present his position was this: That, if 100,000 gallons more than the 4,500,000

gallons flowed over the fish pass, the Corporation could only take the 100,000 gallons.

The CHAIRMAN said it had struck him from the wording of the clause that in that case the Corporation might be able to take all below 4,500,000 gallons.

Mr. PEMBER said the clause had been altered by the Board of Trade with the view of meeting the very point raised by the Chairman.

TUESDAY, JULY 16.

Further evidence in support of the Bill was given to-day.

Mr. *Hall*, C.E., said that he had been appointed by the Corporation as their adviser in regard to the present water scheme. The Corporation had already decided upon their source of supply when he was called in. The scheme was a very simple one, and he thought the promoters had gone to the right source for their supply. He at once acquiesced in the scheme. Apart from trading purposes, he thought Barrow ought to lose no time in obtaining a fresh supply.

Cross-examined: As to the cost of the scheme, though it was £65,000, it must be remembered that 7½ miles of 4-inch pipes was a heavy item to begin with. The estuary would not be affected by the proposed works. He knew of no case in which a corporation charged less than 2d. or 3d. per 1000 gallons; but he should say that the Barrow Corporation would charge customers other than the Hæmatite Steel Company lower rates.

Mr. *Mansergh*, C.E., said he was of opinion that the very simplicity of the scheme was the great argument in its favour.

Mr. *Abernethy*, C.E., stated that he had visited the channel of the Duddon at low water; and it varied very much, being dependent upon the combined action of tide and flood. The deduction of 5 million gallons would not affect the variations of the channels.

Cross-examined: From his observation during the last 40 or 50 years there had been very little change in the sand banks of the estuary.

Mr. *P. Messent*, C.E., Engineer to the Tyne Improvement Commissioners, averred that he could not conceive that the abstraction of 5 million gallons a day would affect the estuary of the Duddon to any appreciable extent.

WEDNESDAY, JULY 17.

On the proceedings being resumed this morning,

Mr *Vernon Harcourt* said he had had large experience in the navigation of rivers. He had examined this project, and had come to the conclusion that the abstraction of the 5 million gallons would have an inappreciable effect on the channel and the estuary. His opinion was the work could be carried out without the smallest danger to the inhabitants of the estuary.

In cross-examination, witness said if there were reservoirs the intermittent character of the supply would be got rid of. He had an idea that part of the present scheme was to connect the stream with the existing reservoirs; but if this was not the case, he could not mention any precedent that he knew of similar to such a project as that proposed.

Mr. *W. Ferguson*, Water Manager to the Barrow Corporation, said that in 1887 the amount of water run to waste was 750 million gallons; and the amount used for domestic consumption was 720 million gallons. The Harlock reservoir might be constructed to hold perhaps 210 million gallons of water; and the site was a very good one.

Cross-examined: Should the Barrow Steel Company's works close through any circumstance, 4 million gallons of water would be thrown upon the hands of the Corporation; and the water-rental would be raised. This would, no doubt, affect the Dalton inhabitants.

The *Marquis of Hartington* deposed that he was the Chairman of the Barrow Hæmatite Company. It was a fact that from time to time his Board had been advised by the Engineers of the Company that it would be necessary to get a larger supply of water. The Board had also debated the question as to whether or not the Corporation could supply the quantity they wanted from existing or authorized works. They were informed that from the present works it could not be supplied. They therefore took the advice of their Engineer, who informed them that the only source of supply would be from the Duddon. Under these circumstances, his Company decided to apply to Parliament for powers to obtain water from the Duddon. The result was that negotiations with the Corporation followed; and their Bill was withdrawn on the faith of the agreement which had been put before the Committee.

Cross-examined, his Lordship said he was not personally acquainted with the matters which had passed at the Board when the water question came up. He could not say when their attention was first directed to the River Duddon. No doubt Mr. Alderman Fell, who was a member of the Board of the Steel Company, was right when he stated that the Engineer was requested to direct his attention to the River Duddon and other sources. His idea was that the report of the Engineers was received a short time before they were compelled to make the necessary application to Parliament. He was not in a position to state the exact amount of water which the Steel Company required.

In re-examination, witness said there was not the slightest prospect, as suggested, that the hæmatite works might stop working.

After some further evidence, Mr. PEMBER announced that this was the case for the promoters.

The CHAIRMAN said: The Committee are of opinion that the promoters of the Bill have not proved their case with regard to so much of the preamble as relates to the additional water-works proposed to be authorized. That portion of the Bill which refers to the Duddon scheme is therefore rejected.

THURSDAY, JULY 19.

On the re-assembling of the Committee this morning,

Mr. PEMBER announced that, in view of the decision of the Committee to reject the Duddon portion of the scheme, his clients had determined to withdraw the other portion of the Bill. There were considerations, he added, that rendered this course advisable.

Mr. SAUNDERS, on behalf of the Dalton Local Board, asked the Committee to allow costs; and in this application he was supported by other petitioners against the Bill.

Mr. PEMBER opposed the application; contending that the failure of the Steel Company to prove their case did not entitle the opponents to costs.

The Committee refused the application.

THE FINANCES OF THE LIVERPOOL CORPORATION WATER DEPARTMENT.—A meeting of the Liverpool Water Committee was held yesterday week, when the City Treasurer reported that during the past half year £100,246 had been received on account of the water revenue. During the corresponding period of last year, the amount received was £92,858. The Treasurer also submitted the following return of the gross actual expenditure and amounts voted by the Council during the half year just ended:—Working expenses, voted £99,260; expended, £50,192. Private plumbing, voted £8000; expended, £1655.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

WEDNESDAY, JULY 24.

(*Before Lords Justices* FRY *and* LOPES.)

M'COLLA *v.* THE CLACTON-ON-SEA GAS AND WATER COMPANY.

This was an appeal from a decision of Mr. Justice Stirling (*ante*, p. 18); and it raised a question of some public interest with regard to the remedy of a householder in case of the refusal or neglect of a water company to supply water to his house when requested to do so. The plaintiff, it will be remembered, is the owner of a house at Clacton-on-Sea, to which water was supplied by the defendant Company. The supply was stopped during the winter months at the plaintiff's request; the house being then unoccupied. In June last the plaintiff, being about to occupy the house for a short time, desired to have the supply of water renewed; and he alleged that the defendants had improperly refused to supply him with water. He accordingly brought the action, claiming a declaration that he was entitled to be supplied with water for domestic purposes by the Company at his house, damages for the refusal of the Company to supply him, and an injunction to restrain the Company from withholding such supply of water. The defendants had, in fact, given the plaintiff a supply of water before the case came into Court; so that practically at that time very little was at issue between the parties but a question of costs. On the plaintiff's moving for an injunction, Mr. Justice Stirling refused to grant it, on the ground that, by reason of section 43 of the Water-Works Clauses Act, 1847, and the decision of the Court of Appeal in the case of *Atkinson v. The Newcastle and Gateshead Water-Works Company*, he had no jurisdiction in the matter. In the latter case, the Court decided that the penalty imposed by section 43 for the breach by a water company of their statutory duties mentioned in that section, was the only remedy for the breach of duty, and that the person aggrieved could not maintain an action for damages against the Company.

Mr. COSTELLOE appeared for the appellant; and Mr. BYRNE, Q.C., and Mr. GATEY for the respondents.

Mr. COSTELLOE, in support of the appeal, endeavoured to distinguish the present case from the case referred to, on the ground that the present plaintiff claimed a declaration of his right to be supplied with water; and the action was not a mere action for damages.

Counsel for the respondents were not called upon.

Lord Justice FRY was of opinion that the case was governed by the decision in *Atkinson v. The Newcastle and Gateshead Water-Works Company*, the effect of which was that the penalty imposed by section 43 of the Act of 1847 was the sole remedy given for the breaches of duty mentioned in that section. This Court was bound by that decision; and his Lordship's mind went entirely with it. The plaintiff was, therefore, not entitled to come to the Court for a declaration of his right in a matter dealt with by section 43.

Lord Justice LOPES concurred.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, JULY 20.

(*Before Mr. Justice* NORTH.)

In re THE BARTON-UPON-HUMBER AND DISTRICT WATER COMPANY.

This was a petition by a shareholder to wind up the Barton-upon-Humber and District Water Company.

Mr. EMDEN, who appeared for the petitioner, said the Company was formed for the purpose of supplying water to the Barton-upon-Humber district. The Company acted upon certain powers granted by a Provisional Order, and also had a Special Act of Parliament, in which they were incorporated. The works were to be completed within three years. This, however, had not been done; and, therefore, their powers had ceased, subject to any further powers being obtained. Unfortunately, in addition to this, debentures had been issued beyond the powers of the Act. Attempts had been made to get other gentlemen to act on the Board, but no one could be found willing to fill the position of a Director; and, in fact, there was nothing to be done with the Company but to wind it up and reconstruct. The only difficulty he felt in the matter, as the Company did not appear, was the recent case before Mr. Justice Kay, of *Blaker v. The Herts and Essex Water Company*, where his Lordship held, as it was a public Company, he could not order a sale.* He feared that might be held to apply to the winding up of this Company—that the undertaking could not be sold in the winding up.

Justice NORTH said that what Justice Kay decided was that the Court could not interfere, at the instance of a debenture-holder, to take the management of the Company out of the hands of the Company or to sell the undertaking. He did not see what that had to do with this case.

Mr. EMDEN observed that he only thought it right to mention the case; and there was the Bradford Navigation Company's case before Vice-Chancellor Malins, where it was decided that the Court had jurisdiction to wind up a canal company incorporated by Act of Parliament, although it might be necessary in the winding up to obtain a further Act in order to sell the undertaking.

Justice NORTH said he did not see any difficulty arising out of the case mentioned.

Mr. EMDEN said the object of the petition would be to reconstruct and obtain further powers from Parliament, and then get a transfer, so as to have an entirely new Company. He went on to state certain other facts alleged in the petition—viz., that the borrowing powers were limited to £6250 on debentures, and that the money received by the Company was £10,000 which had been handed to Messrs. Atkins, who were members of the contracting Company, and also the two remaining Directors. There was also an allegation that those gentlemen had improperly dealt with certain shares, which it might be necessary to go into at the winding up, and that they had issued £1500 of debentures beyond their statutory powers. There was one summons pending by a member to have his name removed from the register, but that was standing over. Unless the alleged irregular transactions in shares were declared not to be binding on the Company, it was commercially insolvent; but if they were set aside, there would be some capital to go on with. He therefore asked for the usual order to wind up.

Justice NORTH said in this case the petition was presented by a shareholder to wind up the Company. It alleged that the water-works to form which the Company was created were not completed; and as matters stood at present, could not be finished—there being no funds for the purpose. Not being completed, of course they had not been opened for public use. It was also alleged that certain steps had been taken by the Directors in respect of which proceedings ought to be taken, as the result of which, if successful, funds would be forthcoming, by means of which the undertaking could have effect given to it. The suggestion made by the petitioner very properly was that there was a difficulty in the way of making an order to wind up, because this Company was established for a

* See JOURNAL, Vol. LIII., p. 766.

public purpose, and nothing else, and inasmuch as the undertaking could not be sold, no profitable result could come from making the winding-up order. The ground upon which this was put was a recent decision of Mr. Justice Kay in *Blaker v. The Herts and Essex Water-Works Company*. That was an action by beneficiaries, in which it was sought to have a sale of the undertaking, and the appointment of a manager until the sale. There the learned Judge declared that the plaintiffs were entitled to a charge on the undertaking, and directed an inquiry as to who were the beneficiaries, and what was due to each of them. But he did not direct a sale or appoint a manager; and he went apparently on the grounds put forward in the well-known case of *Gardner v. The London, Chatham, and Dover Railway Company*. He did not dismiss the action, however; but made an order in it, although he could not at once in Court direct a sale or appoint a manager. This was a case in which, unless the objects of the Company would be prevented, an order for winding-up ought to be made. In the first place, what would be the result if he made no order? Everything that had been spent would be wasted; the works were not completed; the public was not getting any benefit out of them; and nothing had been done for recovering from the persons who were alleged to have made transfers *mala fides* the moneys obtained by such improper dealings. He was not considering now whether or not he could make an order for sale. It might be that ultimately he would be able to do so. It might be that it could be done as was done in the Bradford Navigation Company's case, and in other cases, by getting an Act of Parliament for the purpose of carrying out the sale. If this should be the result in the present case, he could see no difficulty in obtaining an Act if a proper case were made out. In his opinion, the Company ought to be wound up; and it followed that there must be an official liquidator. In making this order, he did not think he was going at all contrary to the decision of Mr. Justice Kay, because what he did was to refuse to take the management out of the hands of the Company. In this case, by appointing an official liquidator, he was not taking it out of the hands of the Company at all, but putting it in the hands of the Court to carry on matters for the Company, and on behalf and for the benefit of the Company—viz., for the creditors first of all, if there were any to be provided for; and beyond that for the benefit of the shareholders. His Lordship then referred to the case of the Free Fishermen of Faversham in the 36th Chancery Division, where the Court did refuse to make an order to wind up on the ground that no benefit could be obtained by it; and he read a long passage from Lord Justice Fry's judgment. He concluded by saying that he considered he was doing the only thing possible for the purpose of securing to the public as much benefit as was intended for them, by directing that the Company should now be wound up, with a view to their carrying on business hereafter if possible, either by themselves or by some other company formed for the purpose.

THE CASTLEFORD WATER SUPPLY CUT OFF.—Recently the Castleford Local Board arranged with the Wakefield Corporation for a supply of Wakefield water to be passed through the mains of Whitwood (an adjoining township). These mains have, however, proved too small to fully supply both Whitwood and Castleford township; and for a considerable time only part of Castleford has been supplied with the Wakefield water. At the last meeting of the Castleford Local Board, a resolution was passed by which the supply will be cut off altogether until a larger main is laid; and the Board have already advertised for tenders for the work, which is to be commenced at once.

RIPON CORPORATION WATER-SUPPLY.—Owing to recent complaints in regard to the quality of the water supply of Ripon, an analysis of the water supplied to the city from the gravitation works at Lumley Moor has been made by Mr. A. H. Allen, F.I.C., F.C.S. The results showed the water to be pure and of very moderate hardness. It contained a marked quantity of peaty matter, doubtless derived from the gathering-ground. This would be removed, and the water improved by careful filtration, though such treatment would not otherwise be necessary if the sample fairly represented the usual condition of the water. There was no sign of contamination by sewage or similar impurity. In Mr. Allen's opinion the water is of very fair quality for drinking and general domestic purposes.

THE NEW WATER SCHEME FOR PONTEFRACT.—Last Thursday the Mayor of Pontefract (Mr. Alderman Mathers) performed the ceremony of turning the first sod in connection with the new water-works at Roall, which will supply Pontefract with an ample and pure supply of water, which the town for some time past has been lacking. The Mayor and Corporation and a number of invited guests were driven down to Roall, which is some seven miles distant from Pontefract in the direction of Goole, and where the wells will be sunk. A beautiful illuminated address to the Mayor was read on the site by the Town Clerk (Mr. E. H. Coleman), after which a presentation spade was given to the Mayor by Lord St. Oswald. The Mayor replied, and then turned the first sod of the new works. A luncheon was given by the Mayor on the return journey in the Town Hall. The cost of the works it is estimated will be £25,000.

KILLED BY AN ELECTRIC LIGHT WIRE.—An inquiry was held at Brighton on Monday evening last week into the death of a man who had lost his life by coming into contact with an electric light wire. The deceased—Thomas Garman, 32 years of age—was night watchman at Messrs. Hallett and Abbey's brewery; and it was part of his duty to go to the roof to examine the liquor vat. Suspended at a height of between 4 and 5 feet over the stand from which this inspection was made was an electric light wire; and on the morning of the above-named day Garman was found lying there dead, with a mark half way round his neck, as if grazed by the wire. A medical examination proved the man to have been perfectly healthy; and it was the opinion of Dr. Lowe that Garman had been killed by the electric current—his neck by some means coming in contact with the wire. The jury returned a verdict accordingly, and expressed an opinion that the wire, which had no communication with the brewery, had been very dangerously hung. It was only five weeks before that another man received a bad shock from the wire.

THE DANGER OF OVERHEAD WIRES.—The New York correspondent of *Industries*, writing on the 6th inst., said: "While there have been many fatal accidents in various parts of America, caused by contact with arc light wires, there has been in most instances contributory negligence on the part of the victim. An accident occurred, however, in this city on July 3, which shows that, even without contributory negligence, there is considerable danger in overhead wires. W. F. Linnell and his father were passing a cigar store at 129, East Eighth Street, when one of the conductors of an arc lamp over the store fell down, striking the young man's hat. He instinctively raised his hand to throw off the wire, and as it was a rainy night, the covering of the wire and the wet pavement on which he stood, afforded a path for the current, the effect of which prevented him from releasing his hold. He fell to the sidewalk, writhing in agony; and his father, in his efforts to release him, also received a severe shock. An Italian from a neighbouring fruit-stand came to the rescue with a hatchet, and severed the wire. Young Linnell had to be taken to the hospital. He was not fatally injured; but he will be scarred for life."

Miscellaneous News.

THE LONDON COUNTY COUNCIL AND THE GAS-TESTING ARRANGEMENTS IN THE METROPOLIS.

THE USE OF PORTABLE PHOTOMETERS.

At the Meeting of the London County Council last Tuesday, the question of the use of portable photometers for testing gas in the Metropolis was again brought forward. The Sanitary and Special Purposes Committee reported that they had duly considered the reference to the Council in April last (see JOURNAL for April 16, p. 725) as to applying to the Board of Trade to introduce a Bill to legalize the use of portable photometers for testing the illuminating power of gas in parts of London remote from any official testing-place. In connection with the subject, the Committee had also considered the question of the substitution of an exact standard of light for the present statutory candle standard, which they said was unsatisfactory; and the Clerk (Mr. De la Hooke) had addressed the following letter to the Secretary of the Board of Trade:—

Sir,—I am directed to request that you will again bring to the notice of the Board of Trade the subject of the defects in the existing legislation applying to the gas supply of the Metropolis, with a view to (1) providing a trustworthy standard of light; (2) prescribing a standard photometer, with which all official photometers should be compared; and (3) giving legal force to tests made with a portable photometer.

(1) On a former occasion (April 21, 1884), the Metropolitan Board of Works asked the Board of Trade to submit to Parliament a proposal for a trustworthy standard of light in place of the present standard candle; and subsequent experience has amply confirmed the opinions then expressed as to the variability of the standard candle, and as to the possibility of providing a more exact unit for light measurement. You are probably aware that, in addition to the investigations on this subject made by the Committee appointed by the Board of Trade in 1879, other investigations have been made by independent scientific authorities, with, in each case, the like result of condemning the present standard candle, and of ascertaining that a much more exact standard of light is attainable. The Council's Chemist and Gas Examiners have carried out two series of experiments which have extended over long periods, and included the careful and simultaneous examination of the various alternative standards proposed. The results of these experiments are embodied in the two reports which are transmitted herewith; and they fully confirm the general conclusions reached by other investigators. The Council desires to point out that the deficiencies of the present candle standard have been acknowledged for nearly ten years, and that the time has arrived for substituting some standard which can be relied upon to give accurate results not liable to be varied by the difference of working of different operators.

(2) The two principal London Gas Companies urge the importance of prescribing a standard photometer with which all official photometers used for testing the illuminating power of gas should conform. The Gaslight and Coke Company state that there are now four kinds of official photometers used in testing the Company's gas, and that each kind gives different results. The South Metropolitan Gas Company agree that the photometers at present in use are not trustworthy; and I am to state that the Council concurs in the opinion that it is desirable that a standard photometer should be prescribed.

(3.) The question of legalizing tests made with a portable photometer has been before the Board of Trade for some years; and it will be unnecessary to enter upon it at length. It will be remembered that the Gas Referees expressed the opinion that "testings made with a portable photometer in various parts of London would be as trustworthy as those now made in the existing testing-places," and that "such testings, carefully and systematically conducted, would afford to the consumers of gas a more complete protection than a great increase in the number of testing-places." With this view the Council fully concurs; and the experience gained in the use of a portable photometer in London since the year 1883 quite confirms it. The Council is of opinion that if the Gas Companies were made liable to penalties for any deficiencies in the illuminating power of the gas they supply to the public, of which evidence might be obtained by means of the portable photometer, a considerable advantage to the public would result.

I am therefore to urge upon the Board of Trade the importance of taking these questions into consideration with as little delay as possible, with a view to the introduction of a Bill into Parliament during the ensuing session.

Mr. W. JAMES moved that the action of the Committee in this matter be confirmed; and the motion was carried.

THE AGITATION AMONG GAS WORKMEN IN THE METROPOLIS.

GREAT DEMONSTRATION IN HYDE PARK.

Last Sunday morning a great demonstration of stokers and other gas workmen took place in Hyde Park, for the purpose of celebrating the success of the movement started by the National Union of Gas Stokers and General Labourers to obtain the eight-hour day for the stokers employed in the Metropolitan gas-works. The progress of this movement has been referred to on several occasions in our columns; but it may be opportune now to mention that it was the outcome of a meeting held on the 23rd of March last, at which the position of the men was discussed, and the necessity of some kind of union for the protection and advancement of their interests was generally acknowledged. A resolution was passed pledging those present to form a Trade Union, the principal object of which should be to reduce the stokers' working day to eight hours. On the 7th of April another meeting was held, when the names of 800 men who had expressed their willingness to join the Union were given in. A week later 200 more had joined; and the result of subsequent meetings has been to bring up to nearly 7000 the total number of men now enrolled. Towards the end of last month the union had assumed such proportions that it was thought advisable to appoint a General Secretary; and Mr. William Thorne—originally a stoker in the Birmingham Gas-Works, but since 1883 in the employ of The Gaslight and Coke Company at their Beckton station—was selected for the position; he having been the leading spirit in several previous agitations among gas stokers, and one of the originators of the present movement. In the course of 17 weeks, therefore, an important organization of a large section of the labour necessary for carrying on the business of gas supply in this Metropolis has been established We stated above that the membership of the union now numbers nearly 7000. The exact total a few days since, as given by the organ of the union was 6281; the numerical strength of the various branches being as follows:—Barking, 328; Brentford, 168; Canning Town, 1800; East Greenwich 278; East Ham, 246; Erith, 100; Fulham, 500; Haggerston and Shoreditch 200; Kensall Green, 300; King's Cross, 200; Nine Elms, 700; Old Kent Road 400; Plumstead, 90; Poplar, 316; Rotherhithe, 300; Sydenham, 155; Woolwich 200. Contingents from these districts assembled, with bands and a great display of banners, about eleven o'clock last Sunday morning on the Thames Embankment, and in conjunction with representatives of various trade

benefit, and temperance societies, also bearing their banners, formed into a procession, and marched to Hyde Park, which was reached about half-past twelve. Some idea may be formed of the length of the procession when it is stated that, moving at ordinary marching pace, it took about 20 minutes to pass into the Park through the gate opposite Constitution Hill; and its numerical strength may be estimated from the fact that the men walked generally four or six abreast. On reaching the open part of the Park, addresses were delivered from three platforms; among the speakers being Mr. J. Burns, Rev. W. Morris, Mr. W. Thorne, Mr. H. H Champion, and Mr. H. Burrows. The text of all the speeches was congratulation for what had been accomplished, and exhortation to united action to secure for the labouring classes a universal eight-hour day. At two o'clock the following resolution was put simultaneously from the three platforms, and carried by acclamation :—"That this mass meeting of gas workers and others, met to celebrate their victory in obtaining a reduction of working hours to eight a day, by means of combination, hereby pledge themselves to assist their fellows by every means in their power to obtain eight hours as a maximum working day for all workers; and we call upon the County Councils and all corporate bodies, together with the Houses of Parliament, to assist in this matter, by at once conceding the same in all departments under their control, and in all contracts authorized by them; and that this resolution be forwarded to the Press, and to the leaders on both sides of the House of Commons." The proceedings then closed. It is due to the organizers of the demonstration to record that, as far as we had an opportunity of observing, it was conducted throughout in a very orderly manner.

GAS UNDERTAKINGS AND THE REVISED RAILWAY RATES FOR COAL.

In accordance with the announcement made in the JOURNAL last week, a meeting of representatives of important gas undertakings was held at the Corporation Gas Offices, Birmingham, on Thursday last, to consider the matter of the proposed abolition by the railway companies of the rebate hitherto allowed on the carriage of gas coals, and the course to be pursued with a view to the question being laid before the Railway Commissioners. There were present: Alderman Pollack, Chairman of the Gas Committee of the Birmingham Corporation; Mr. E. O. Smith, Town Clerk of Birmingham; Mr. Edwin Smith, Secretary of the Birmingham Corporation Gas Committee; the Mayor and Town Clerk of Walsall; Alderman Farley, of West Bromwich; Alderman Petrie, of Rochdale; Mr. Andrews, of Coventry; and the following gentlemen connected with the gas undertakings at the places named :—Messrs. Ball (Loughborough), Barlow (Peterborough), Belton (Shrewsbury), Colson (Leicester), Cooper (Banbury), Cranmer (Stratford-on-Avon), Deakes, Worcester), Haddon (Great Malvern), Kimbell (Wellingborough), Meiklejohn (Oldbury), Parlby (Hereford), Paterson (Cheltenham), Simpson (Rugby), Taplay (Stoke-upon-Trent). Letters were read from the Corporations of Leeds, Salford, Carlisle, Huddersfield, Keighley, and Dewsbury, and from several Gas Companies, in approval of the proposed movement. In the discussion that ensued, it was stated that a friendly test action had been instituted on behalf of the South Yorkshire and North Derbyshire Coal-Owners, to determine the matter of "undue preference" in regard to gas coal traffic, and that the necessary formalities to be observed in the introduction of the case before the Commission would render it impossible for a decision to be obtained before the Long Vacation. A Committee was formed; and it was resolved that at the expiration of the Long Vacation another meeting should be held for the purpose of adding to the Committee and determining future proceedings. Subscriptions of considerable amount in support of the movement were read; and, in addition to the undertakings represented at the meeting, subscriptions have been promised from the following gas undertakings :—Bath, Crystal Palace District, Dover, Folkestone, Hinckley, Reading, Slough, Southport, and Wigan. Considering the shortness of the notice at which the conference was called, other communications will doubtless be made; and they should be addressed to Mr. Edwin Smith, City Gas Offices, Birmingham.

DEVONPORT GAS COMPANY.

The Annual Meeting of this Company was held last Tuesday—Mr. R. C. SMITH presiding.

The report of the Directors for the year terminating on May 31 last stated that the sales of gas and meter rentals yielded £18,312; and residuals, comprising coke, tar, and sulphate of ammonia, realized £4475 6s. 8d.—the total revenue for the year being £22,794, as compared with £23,022 in the preceding year. The expenditure amounted to £17,785; leaving a balance on the working account of £5008, which was carried to the net revenue account. After debiting this account with the interim dividend amounting to £2200, there remained a disposable balance of £6241 from which the Directors recommended the payment of the usual dividends at the rate of 10 per cent. on the original and of 6 per cent. on the guaranteed shares, free of income-tax. The capital expenditure on plant and works during the year was limited to the further equipment of the new retort-house, by which the producing power of the works has been largely increased.

The CHAIRMAN, in moving the adoption of the report, said that by comparing the proceeds from the sales of gas and meter-rentals (£18,312) with the receipts of the previous year, they would find that there had been a small falling off of about 2¼ per cent. This was, he thought, the first occasion for eight or ten years on which they had had a decrease in their income. It was rather an anomaly that there should be this decrease; but the fact remained. He was rather inclined to attribute it to the circumstance that during the past season they had passed through a remarkably mild winter; and that the consumption of gas for heating purposes was not so great as during the winter season of the previous year. The decrease was reduced, however, by their residuals having produced a larger sum this year than last. There had been an increase under that head of £254; and this reduced the decrease upon the entire revenue for the year to just 1 per cent. The result was that they had a balance of £5008 upon the working account; and this sum being carried down to the net revenue account, after the payment of the authorized dividends for the year, gave an available balance of £6241, from which the Directors recommended the payment of the usual dividends. He thought it was very fortunate that they had on this occasion a larger balance to carry forward than they had had for some years past; because from the facts he had mentioned, they would see that their prospects were not quite so clear or promising as they were during former years.

Mr. P. A. LITTLETON seconded the adoption of the report and accounts.

Mr. H. F. WILLEY (Exeter) said he did not think the fact of their having a slightly diminished revenue need cause them to be disheartened, for, comparing the accounts of the last three or four years, he saw that in 1887 the balance was £4362; last year it was £4549; and this year £5008. This, he considered, was a matter of congratulation, as it showed that the Company was in a sound financial position. He thought their revenue might be further increased if the Company were to encourage the use of gas-stoves among the residents of the town. It would be in their interest if they were to obtain a large number of these stoves, and let them out on hire at a certain rental per year. If this were done, he believed it would popularize the use of gas, and thus add to the income of the Company.

The CHAIRMAN, in reply, observed, with regard to the suggestion that the Company should let gas-stoves on hire, with a view to increasing the consumption of gas, that they had hitherto avoided interfering with what they regarded as the legitimate business of the tradesmen of the town. If they were to take up the gas-stove trade, and either sell or let out stoves on hire, tradesmen would rightly regard it as an interference with their business; and on this ground, although it might perhaps encourage the consumption of gas, he was bound to say that he was decidedly opposed to it. However, the suggestion having been made, he promised that the Directors would give it their full consideration.

The motion was adopted; and the dividends recommended were declared.

Mr. WILLEY, in moving a vote of thanks to the Chairman and Directors for the successful manner in which they had conducted the affairs of the Company during the year, again referred to the question of gas-stoves. He had, he said, every confidence that the Directors would give the matter their close and careful consideration; but he would mention for their information, and possibly for their guidance, that in one town a gas company had sold, and let out on hire, no less than 500 gas-stoves in one week—thus showing that the action of the company was greatly appreciated by the householders.

The motion was seconded, and agreed to; and the Chairman having responded, the proceedings terminated.

WARRINGTON CORPORATION GAS SUPPLY.

In a paragraph in the last number of the JOURNAL, reference was made to the abstract of the accounts of the Borough Treasurer of Warrington (Mr. C. Chorley) which has lately been issued, and which contain an unusual amount of information in relation to the Corporation's gas undertaking. In addition to the revenue account for the year ending in March last, there is, as already stated, an abstract of the accounts of the Gas Department from the date of the purchase by the Corporation—June, 1877—to March 25, 1889. This lengthy statement has been prepared by Mr. Voisey, a member of the Council, in pursuance of a resolution passed by that body early in the year; and it is intended to show the actual position of the Corporation in relation to the undertaking.

Dealing first with the revenue account for the year ended March 25, 1889, we find that the receipts from the sale of gas and meter-rents amounted to £27,657 18s. 6d., as compared with £26,500 10s. 1½d. for the previous year. Fittings yielded a revenue of £1079 16s. 5d.; coke, £2170 13s. 2d.; tar, £1813 8s. 9d.; and sulphate of ammonia, £1762 7s. 11d. On the other side of the account are: Wages, gas manufacture, £2661 0s. 9d.; coal and cannel, £9906 16s. 2d. (last year £10,385 10s. 9d.); purifying, £197 19s. 2d.; meter inspection and repairs, £723 16s. 8d.; lamp repairs, £193 3s. 4d.; lamp lighting, £472 11s. 1d.; salaries, £1062 6s. 6d. (against £1246 13s. last year); rates and taxes, £1596 17s. 8d.; office expenses, £108 12s. 6d.; fittings, £777 1s. 2d. Omitting various items both of receipt and repairs, as well as the bank balance, we find that the amount paid to the Borough Treasurer is £12,411 1s., upon which, of course, are the usual charges for interest, sinking fund, &c.

Mr. Voisey's report is of an elaborate character. He sets out with an account of the capital cost of the undertaking to March 25, 1889. The total he makes to be £198,999 15s. 10d. The capitalized value of the 5400 shares in the old Company, *plus* 25 years' purchase, was £153,000, to which there was to be added a bonus of 10s. per share; making the total original cost £155,700. To this Mr. Voisey adds £44,380 10s. 10d. expended by the Corporation on extensions, and credited to capital account; and £11,983 0s. 3d., which was also laid out in extensions, but, though in the nature of capital outlay, which came from profits. These items, added to the original cost, make a total of £212,063 11s. 1d.; and in order to arrive at the actual capital, various credits have to be allowed. Certain assets of the old Company, including the trade stock, cash at bank, cash in hand, sum invested in Consols, &c., are, after various deductions and allowances, credited against the capital cost. In this way a sum of £11,285 11s. 3d. is deducted; while credit is also taken for £703, received by the Borough Treasurer as premiums on capital loans, and for £1075 4s. saved by redeeming annuities at less than 25 years' purchase. Since the Corporation acquired the gas-works, the total profit made has been £135,418 7s. 1½d. Adding bank interest, £147 12s. 2d., and rents, £31 6s. 8d., there is under this head £135,597 5s. 11½d. Against this there are charged £3066 13s. 4d. for parliamentary and law expenses; £57,962 7s. paid as annuities; and £22,566 15s. 2d., the interest paid on loans—leaving a balance of £52,001 10s. 5½d. The trade profits of the works are shown to be as follows:—In 1877, £4618 9s. 6½d.; in 1878, £4433 1s. 10½d.; in 1879, £8944 17s. 10d.; in 1880, £10,514 4s. 11d.; in 1881, £10,067 17s.; in 1882, £12,813 10s. 10½d.; in 1883, £13,170 3s. 7d.; in 1884, £13,657 4s. 2d.; in 1885, £9078 2s. 2½d.; in 1886, £9749 0s. 6d.; in 1887, £11,844 0s. 7½d.; in 1888, £12,187 10s. 7d.; in 1889, £14,340 3s. 5d.—making a total of £135,418 7s. 1½d. The balance statement at March 25 last, is as follows:—Assets, capital cost of purchase of the gas-works undertaking and of extensions and other capital outlay since the purchase, £198,999 15s. 10d.; floating assets at the works, as per published accounts for the year ended March 25, 1889, £17,060 11s. 6½d. Add liability on old bond debt of the Gas Company, standing to the credit of a loan account in the books of account at the gas offices, but not a liability of that office, and now included in the Borough Treasurer's account of entire liability on loan account so far as not actually paid off, £5350; making a sum of £22,410 11s. 6½d. Adding the amount placed to a separate account at the bank on a reserve or suspense account, being part of the moneys received from the Gas Committee, £2500, there is a total of £223,910 7s. 4½d. The liabilities were: The original capitalized value of annuities to the shareholders in the old Company, £153,000; deduct saving effected to March 25, 1889, in redeeming annuities at less than 25 years' purchase, £1075 4s.—leaving £151,924 16s.; deduct redemptions in the form of sinking fund payments, £30,492 6s.—leaving £121,432 10s. This sum represents 25 years' purchase of annuities still unredeemed—namely, 1435 at £2, and 2839 at 14s. The loan capital owing at this date is £50,050; bank balance on three several accounts, £426 6s. 11d.; revenue or gas-works profit, representing sinking fund account, £27,783. The actual payments on sinking fund account have been as per balance statement. Annuities redeemed, £19,492 6s.; repayments on account of authorized loan of £47,000, £8950—making £28,442 6s.; balance or surplus, £24,218 10s. 5½d. These sums make £52,001 10s. 5½d., or a grand total of £223,910 7s. 4½d.

Mr. Voisey concludes his statement with the following memoranda :—"The accumulated profit of £52,001 10s. 5½d. is considered to be available first to meet the Corporation's liability under the head of sinking fund, and next for the purposes designated in section 43 of the Warrington Corporation Gas Act, 1877. The sinking fund liability to the date of March 25, 1889, was as follows :—(1) A sum per year equal to 1-75th of

£153,000, the capitalized value of the annuities at the date of the purchase of the gas-works undertaking from the 1st of January, 1881 (inclusive), to the 1st of January, 1889, or £2040 by nine years, equal to £18,360. (2) A sum per year equal to 1-50th of £47,000, authorized to be borrowed for capital gas-works extensions; and of £5350, the bond debt taken over from the old Company—together, £52,350 for the same period, or £1047 by 9 years, equal to £9423; making £27,783. The accumulated profit to March 25, 1889, is shown to be £52,001 10s. 5½d.; leaving a balance to be disposed of, under section 43 of the Act which authorized the purchase of the gas-works, of £24,218 10s. 5½d. The gas-works profit for the year ended March 25, 1889, is shown to be £14,340 3s. 5d. The amount paid in gas annuities for that year was £4852 7s.; for interest on loans, £1958 18s. 4d.; and the amounts chargeable as sinking fund were £2040 and £1047, or £3087; making with the gas annuities, interest on loans, and amounts charged on sinking fund, £9898 5s. 4d., and leaving a net profit for the year of £4441 18s. 1d."

GREENOCK CORPORATION GAS SUPPLY.

At the last Monthly Meeting of the Greenock Gas Trust (Police Board), the affairs of the Corporation gas undertaking for the past year were brought up for consideration in the minutes presented by the Gas Committee. They were summarized last week by our Glasgow correspondent, who has sent the following additional particulars. The minutes contained statements of the revenue and expenditure for the year ending June 30 last. After examination, these were approved. They showed that the income was £36,752 16s. 6d., and that the expenditure amounted to £34,407 2s. 2d.; leaving a surplus balance of £2345 12s. 4d. The following is an abstract statement, together with the statement for the year 1887-8, for the sake of comparison:—

Revenue.

	1888-9.		1887-8.	
Consumers by meter	£24,445 6 6	..	£24,034 19 0	
,, by contract	2,286 15 6	..	2,220 4 5	
Residual products	5,238 15 0	..	5,399 13 7	
Town and harbour lamps	4,555 9 11	..	4,710 6 9	
Property	123 8 5	..	185 14 10	
Bad debts recovered	25 7 0	..	22 14 6	
Rental from gas-stoves	41 16 6	..	32 0 1	
Interest on pipes	1 1 6	..	3 0 10	
Oxide for purification	34 16 2	..	2 10 9	
	£36,752 16 6		£36,561 4 9	

Expenditure.

	1888-9.		1887-8.	
Coals	£10,330 19 8	..	£9,713 18 9	
Interest	5,528 10 2	..	5,411 7 4	
Sinking fund	3,000 0 0	..	3,000 0 0	
Wages and salaries	5,270 6 1	..	5,275 13 8	
Repairs to retort-bench	1,788 6 3	..	1,810 15 5*	
Feu duties, taxes, insurance, &c.	2,426 18 0	..	2,405 0 1	
Lime for purification	706 12 10	..	559 14 6	
Cartage of ashes	109 6 3	..	128 18 0	
Stationery, printing, advertising, &c.	126 0 8	..	130 1 4	
Repairs to buildings, apparatus, mains, services, and meters	1,058 9 1	..	1,146 0 8	
Town and harbour lamps	1,901 8 5	..	1,788 11 0	
Working residual products	1,532 3 0	..	1,798 13 1	
Income-tax	87 14 8	..	96 4 6	
Incidental expenses	131 5 6	..	110 6 0	
	£33,998 0 2	..	£33,975 4 4	
Gas-meters	167 1 9	..	114 12 6	
Main and service pipes	242 2 3	..	71 7 11	
	£34,407 4 2	..	£33,561 4 9	
Profits	2,345 12 4	..	3,000 0 0	
	£36,752 16 6	..	£36,561 4 9	

* Including £1800 for the Klönne bench.

From these figures it will be seen that the profits amounted in 1887-8 to £3000; and it may be mentioned that the amount under this head in 1886-7 was £2500.

Bailie M'Onie, as Convener of the Gas Committee, moved the adoption of the minutes. He said there were two periods of the year when the minutes of the Gas Committee contained what to him at least was matter of special interest. They were what were called the budget meeting and the annual report meeting. On that occasion the annual report came before the Board for their approval; and he was pleased at being able to say that, so far as he was aware, there was nothing in it except what was matter for congratulation to the Committee and to the Board. The members would also see from the draft financial statement that the gas accounts were in a fairly satisfactory condition, and that the surplus during the past year amounted to £2345. This was a little more than they anticipated when their budget was made up nearly a year ago; and he took the opportunity of saying that this favourable result had been attained, not only by the care the Committee took in looking after all matters that came before them, but also by the able manner in which they had been seconded by their officials, especially by Mr. Stewart (the Manager) and Mr. Chalmers, who had done their very best to produce a satisfactory balance-sheet. At a later stage in his remarks, the Convener referred to the fact that in the minutes mention was made of water gas, and that this question had come before the Committee, some of whom it had scared a little. The Manager had been asked to send in a report on the subject; but since then he had been enjoying a well-earned and much-needed holiday. When he came back he was not ready with the report; but as they had somewhat recovered from the scare on the water gas question, they were not in such a hurry to have the report immediately.

The motion for the approval of the minutes was seconded by Dean of Guild Borland, and then a long discussion took place in reference to the desirability of greatly curtailing the street lighting during a large part of the year, even to the extent of leaving all the lamps in the town unlighted during a period of six weeks at midsummer. In the course of the discussion, Bailie M'Onie remarked that it was not the duty of the Gas Committee to deal with the lighting of the town, and that the question should be considered by the Finance Committee of the Police Board; but the Gas Committee would be very thankful to take instructions from the Board as to how much gas they wanted to buy.

At the close of the discussion, the minutes were approved; and, on the motion of Provost Shankland, it was agreed that the question of supplying gas for street lighting during midsummer should be remitted to the Police Board Finance Committee for consideration; further, that the balance-sheet of the Gas Trust be approved of, and that the surplus of £2345 be placed to the credit of the Board for general purposes, in terms of the Police Act.

NOTTINGHAM AND DERBY WATER GAS COMPANY.

The Statutory Meeting of this Company was held at Nottingham last Wednesday—Alderman GOLDSCHMIDT, J.P., in the chair.

The notice convening the meeting having been read,

The CHAIRMAN said he had to announce that the capital had been subscribed many times over. The Directors wished to call the attention of the shareholders to an agreement with the parent Company. They were aware that it was agreed to pay £50,000 in cash and £50,000 in fully-paid shares, and £1000 in fully-paid founders' shares. This money was to be paid for certain licences which the parent Company were to grant them. Up to the present time, they had not accepted these licences, as they were extremely anxious to satisfy themselves as to the position of affairs before they parted with any money; and no money, had therefore been paid. They had endeavoured to arrive at an arrangement which they thought would be more advantageous to the Nottingham Company; and they had come to the following terms:—They were to pay the parent Company £30,000 in cash, instead of £50,000; and for the residue of £20,000, they proposed to give ordinary shares to this value, which, whilst they ranked for dividend, were not negotiable for two years. Then they had agreed that the £50,000 ordinary shares should be converted into deferred "B" shares, which should not rank for dividend until the ordinary shares had received 10 per cent. for five years; and in case of liquidation, the deferred shares should have no claim to participate in the assets of the Company. The parent Company had, moreover, agreed to give them two other counties. One of these would be Staffordshire, and the other either Warwick or Cheshire. Then they were to be allowed to manufacture their own plant or to get it manufactured, and pay the parent Company a small percentage on the outlay. Those were the conditions which he asked the meeting to ratify, and under which the Directors thought they would be able to make the undertaking a success. The unpaid capital, which, in accordance with the prospectus, was now due, they did not intend to call up at present. In conclusion, he moved a resolution in favour of the new arrangements which he had described.

Mr. J. T. M'CRAITH seconded the motion.

Mr. KETTLEWELL asked whether the Directors had made any attempt to get to work with the patent they had acquired—whether a manager and travellers had been appointed and orders solicited.

The CHAIRMAN replied that they were not entitled to put any works down until they had received the licences from the parent Company. They had, however, already 20 *bonâ fide* applications in their office, which would not be neglected after that meeting.

Mr. SPEED said he presumed the Directors had some reason for not carrying out the contract in its entirety; and he asked whether that reason still existed. Of course it was better to lose £30,000 than £50,000; but it was still better not to lose anything at all.

The CHAIRMAN said the Directors had made the soundest proposal they could to the meeting; and the alternative was litigation, which might cost £15,000 or £20,000.

After some further discussion,

Mr. W. H. FARMER asked whether the statement on the prospectus that one firm—the Leeds Forge—had saved £10,000 per annum by the use of water gas had been confirmed on inquiry.

The CHAIRMAN said they had no reason to doubt the statement. Moreover, he had himself sent a practical engineer to Germany, where water gas was used; and his report was entirely satisfactory.

Mr. J. W. M'CRAITH, in reply to a question, said that as to the validity of the patent, the shareholders, as was usual, must take the risk.

The resolution was then put to the meeting and carried.

A vote of thanks to the Directors concluded the proceedings.

GAS AND WATER WORKS FOR FIGUEIRA DA FOZ (PORTUGAL).

OPENING OF THE GAS-WORKS.

The gas-works which have been erected for the Anglo-Portuguese Gas and Water Company, Limited, by Messrs. R. Laidlaw and Son, of Glasgow, from the designs and under the superintendence of Mr. A. F. Phillips, C.E., of Great George Street, Westminster, for the supply of the town of Figueira da Foz, were opened on the 23rd ult., with every indication of success—Mr. Phillips attending on behalf of the Company, and Mr. David Laidlaw for the contractors. The *Correio da Figueira* of the 29th ult., referring to the event, said: "The inauguration of the gas in this city on the 23rd inst. was not one of the least things which has aroused the curiosity of the people of Figueira and its visitors—the first, because they are about to enjoy one of the modern manifestations of progress; and the second, because many of them wish to see a light without a wick or oil or petroleum. Every one was satisfied. The quay was illuminated; the two squares, the streets parallel with the river, the club, and a great number of the large establishments. The light was clear; and the streets were illuminated—making a good contrast with the old petroleum lamps. The brilliancy of the light has continued; and the benefits resulting from it will become more and more appreciated both by the public and the private consumers." The demand for the gas is great, so much so that the Company have some difficulty in laying the services and fitting up the houses as fast as the orders come in. Rapid progress is being made with the construction of the water-works which the Company are carrying out for the supply of the same town; and it is hoped they will be completed and opened by the end of August next. The Company experienced considerable delay in this part of their business, owing to legal difficulties in acquiring the land for the construction of the collecting galleries to obtain the water necessary for supplying the town. The prospects of the Company's undertaking for the supply of gas and water to the town, in accordance with the terms of the concessions which have been granted by the Municipality, are highly promising, owing to the rapid development which is taking place. Whole streets of new houses are being erected. The town enjoys considerable prosperity from the large number of visitors, Spanish and Portuguese, who yearly go there for the sea bathing; the population during the season being more than doubled. The town at present has no supply of drinking water, except that which is brought by carts from a distance, or carried by women who have to toil up a hill a mile long in the hot sun with pitchers on their heads. It is reasonable to suppose that a supply of good water brought from the mountains will be highly appreciated in such a place, and ought in due time to yield the Company a satisfactory revenue.

WESTHOUGHTON GAS COMPANY.—The balance-sheet of this Company for the half year ending June 30 last has just been issued. The total receipts are £1125 12s. 5d.; the sale of gas to private consumers and for public lighting under contract producing £949 7s. 5d. The aggregate expenditure was £718 11s. 2d.; showing a balance of £407 1s. 3d., which added to £565 1s. 5d. brought forward from the previous half year, leaves £908 13s. 7d., out of which the Directors recommend a dividend at the rate of £4 per cent. per annum, free from income-tax.

THE READING AND RECREATION ROOM AT THE DOVER GAS-WORKS.

The Education of Stokers.

Our readers will remember that about two years ago a reading and recreation room, for the use of stokers and other *employés* at the Dover Gas-Works, was started by way of experiment. We have on various occasions recorded the good progress of the movement, which was initiated by the Company's Resident Engineer (Mr. R. Herring) with the view of generally improving the men, and, by rendering them more competent for the discharge of their duties, benefiting both employed and employer. The success which has attended his efforts shows that there is room for good and useful work to be done in this direction. Writing to us recently on this matter, he said: "I am convinced the time has come to instruct the workers in the gas-works. For perfect work, which ensures good results, workmen must be intimately acquainted with every detail of their business; and if rooms are established on the works this can be done. Up to the present time, what steps have been taken to give instruction to the gas makers? Engineers and managers can get it; but not the workers. This should not be. In work of less importance than gas making, an apprenticeship must be served. How different with the stoker, who is invariably judged from a bone-and-muscle point of view. This state of things ought not to continue. Now is the time to tell our workers in this great industry all we know about it, and at the same time instruct the foreman, who, from his intimate acquaintance with the men, is the best medium for seeing the work done as you wish, and, if necessary, must show the men how to do it. From personal experience, I know all this can be best done at the works, where some of the engineer's leisure time can be devoted to the movement; for I wish it to be understood that in this, as in many other things, example goes a very long way to ensure success. Let books be provided, lectures and readings given, all relating to the men's work. If this be persevered with, the men will soon be found to take a lively personal interest in their several occupations. Here at Dover we have in the lending library 141 volumes. Some of these have been given (thanks to the Press); others will be added as the funds permit. Some recent additions have been made to the recreative portion of the scheme, which includes a full-sized bagatelle table, a German bagatelle board, and other games; chess, draughts, cards, and dominoes are also provided." Mr. Herring adds that the success of the movement is mainly due to the kindness and liberality of the Chairman (Mr. W. Mannering) and the Directors of the Company, who have generously assisted him in providing an institution in which instruction and recreation may be obtained. This sympathy on the part of the Board with a movement which has for its object the amelioration of the condition of those who occupy the subordinate positions in their undertaking is fully appreciated by Engineer and men alike; and it goes a long way to improve the *morale* of the men, and to inspire them with a wish to discharge their duties in a better spirit and with more intelligence. In connection with the Dover gas workmen, it may be mentioned that they had their annual excursion on the 10th inst.; the place selected being Brighton. The party left Dover by an early train, in order to have a long day at the popular south-coast watering-place, the many attractions of which occupied all the available time till the return journey was commenced.

METROPOLIS WATER SUPPLY.

Statistics of Metropolitan Water Companies.

There have recently been issued two Parliamentary Papers containing important statistics in regard to water supply which were presented to Parliament in pursuance of orders obtained by Mr. J. F. B. Firth last session. One of the papers related to a number of large towns in the United Kingdom; the other to the Metropolis. Both papers are of considerable interest to our readers; but to-day we purpose dealing only with the second return, which was ordered to be printed on May 31 last, and was delivered last Wednesday. It shows, in respect of the Metropolitan Water Companies, the maximum number of houses or other buildings supplied with water by each of them in the years 1883 and 1887 respectively, and the total amount of the rates, rentals, and any other charges received for the supply of water to houses or other buildings, excluding garden supplies, during the financial year ending in September or December (according to the date to which the annual accounts of each Company were made up) in the years 1883 and 1887 respectively. It also gives, in respect of the Companies, as regards each financial half year subsequent to September or December, 1883 (according to the dates to which the accounts of the Companies were made up), the following particulars:—(1) The total amount paid by the Company by way of dividend; (2) the rate per cent. per annum of the dividend paid; (3) the amount of share capital (within the meaning of section 39 of the Metropolis Water Act, 1871, and including loan capital converted into share capital paid up during the half year in respect of capital taken up during such half year or previously by corporations or persons who, when such share capital was taken up, were shareholders of the Company; (4) whether such share capital was taken up at par, and, if not, at what price per £100; (5) the amount of loan capital (within the meaning of section 39 of the Metropolis Water Act, 1871) paid up during the half year, in respect of loan capital taken up during such half year or previously by corporations or persons who, when such loan capital was taken up, were shareholders of the company; (6) the rate per cent. per annum payable on such loan capital; (7) whether such loan capital was taken up at par, and, if not, at what price per £100; (8) the amount of bonuses or other payments made to shareholders, excluding dividends, but including, in the case of the New River Company, any payments in respect of the landed estate, houses, or property of that Company not directly used for or connected with their water supply. In addition to the foregoing, the return shows (*a*) the amount of share and loan capital respectively of each Company at the end of the financial half year next after September or December, 1883, according to the date to which the accounts of the Company were made up; (*b*) the amount of such share and loan capital at the end of the last financial half year to which the accounts of the Company have been made up and audited; (*c*) the value of the share and loan capital of each Company, according to the Stock Exchange List, on or about the 31st of December in the years 1883 and 1887 respectively. All these particulars are in continuation of those contained in Parliamentary Paper No. 136, of the session of 1885.

The statistics asked for, which are set out in eight large tables, are preceded by a Memorandum, which states that, as in the previous paper, the bulk of the information given has been furnished by the Companies themselves. The sole exception is the statement of the values of the share and loan capitals of the several undertakings, which has been supplied, as before, by the Committee of the Stock Exchange. With regard to these values, the Secretary of the Share and Loan Department of the Exchange again explains that many of the prices on which the calculations have been based are only estimates. He adds: "At the end of 1883 only 16, and at the end of 1887 only 18 of the securities of the London Water Companies were quoted in the Official List. The Department has had, therefore, in estimating the value of the other stocks, to fall back upon private and unofficial, though thoroughly reliable sources. The terminable loans of the Companies have been taken at par. Where no recent actual dealings had taken place, the mean prices at the end of 1883 and 1887 respectively have been adopted as the bases for the calculations. It is pointed out that while the previous return was for twelve years, the present one is for four and a half, or, in the case of the Companies whose accounts are made up in June, four years only. Two Companies only—the Grand Junction and the Southwark and Vauxhall—have found it practicable to exclude from their total receipts the amount taken in respect of garden supplies.

The following table shows in respect of each of the Companies the maximum number of houses or other buildings supplied with water in the years 1883 and 1887, and the total amount of the rates, rentals, and other charges received for the supply of water to houses or other buildings during the financial years 1883 and 1887:—

Name of Company.	Number of Houses or other Buildings supplied.		Inc. per Cent.	Water rentals from Houses or other Buildings.		Inc. or Dec. (*a*) per Cent.
	1883.	1887.		1883.	1887.	
				£	£	
Chelsea	32,430	34,615	6·70	103,704	123,492	19·1
East London	141,738	160,191	13·02	238,939	247,815	3·7
Grand Junction	46,517	52,136	12·10	145,816	159,332	9·6
Kent	58,784	68,364	16·30	79,927	90,170	12·8
Lambeth	75,623	85,989	13·70	167,455	191,935	14·6
New River	140,353	149,457	6·50	412,090	433,387	5·2
Southwark and Vauxhall	100,854	108,741	7·80	177,528	168,646	5·0 (*a*)
West Middlesex	62,950	69,669	10·70	173,399	207,001	19·4
Totals	659,249	729,162	10·60	1,498,358	1,621,678	8·2

It will be observed that between 1883 and 1887 the number of houses or other buildings supplied with water by the Companies rose from 659,249 to 729,162—an increase of 10·6 per cent.; while the water-rentals in respect of such houses and buildings rose from £1,498,358 to £1,621,678, or 8·2 per cent. The average rental thus fell from £2 5s. 5d. per house in 1883, to £2 4s. 5d. per house in 1887, or 2·2 per cent. In this respect the period under review contrasts with that from 1872 to 1883, during which the average rental rose from £1 18s. 1d. to £2 5s. 5d. per house, or 19·9 per cent.

As regards the profits made by shareholders during the period to which the return relates, it will be seen that whereas during the twelve years (1872 to 1883) included in the previous return, the rate per cent. of the dividends, in nearly every case, steadily rose from the commencement to the end of the period, some have fallen, and only two have considerably risen during the period from 1883 to 1887. The gross amounts of dividends paid during the periods to which the return relates, and the rates per cent. for the first and last half years, are shown below; but, on account of the difference in the length of the periods, the results are given in separate tables.

Dividends paid in respect of the Nine Half Years from March, 1884, to March, 1888, and Rates per Cent. for the First and Last Half Years.

Name of Company.	Amounts of Dividends.	Rate per Cent.	
		Half Year ended March, 1884.	Half Year ended March, 1888.
	£		
Chelsea	236,822	7½	9
Grand Junction	*427,218	8½ on ordinary stock.	9 on ordinary stock.
Lambeth	497,160	7½	7½ on about one-third. 9 on about two-thirds.
Southwark and Vauxhall	†390,294	8 on ordinary stock.	6 on ordinary stock.
West Middlesex	557,458	10½	10
Total	2,128,952	—	—

* This includes dividends on £25 "C" shares, and new £50 shares, at the maximum rate of 7½ and 7 per cent. respectively.
† This includes dividends at 5 per cent. on preference stock.

Dividends paid in respect of the Eight Half Years from June, 1884, to December, 1887, and Rates per Cent. for the First and Last Half Years.

Name of Company.	Amount of Dividends.	Rate per Cent.	
		Half Year ended June, 1884.	Half Year ended December, 1887.
	£		
East London	509,722	7½	7
Kent	*286,680	10	10
New River	964,496	£11 18s. 8d.	£11 18s. 8d.
Total	1,760,898	—	—

* This includes dividends on new shares at the maximum rate of 7 per cent.

As to share and loan capital taken up at par by shareholders, it will be seen from the subjoined table that only £343,692 of share and £174,935 of loan capital were taken up in this way during 1883 to 1887, as against £2,202,433 of share and £715,117 of loan capital during 1872 to 1883:—

Amount of Capital paid up during the Period from 1883 to 1887, taken up by Shareholders at par.

Name of Company.	Share.	Loan.
	£	£
Chelsea	27,550	—
Kent	74,118	—
Lambeth	119,027	75,000
Southwark and Vauxhall	122,473	—
West Middlesex	525	99,935
Total	343,692	174,935

The following table shows the amounts and estimated values of the share capitals of the several Companies at the dates specified in the return:—

Name of Company.	Amount of Share Capital in		Inc. per Cent.	* Estimated Value of Share Capital on or about		Inc. or Dec. (a) per Cent.
	March or June, 1884.	Dec., 1887, or March, 1888		Dec. 31, 1883.	Dec. 31, 1887.	
	£	£		£	£	
Chelsea	1,000,600	1,080,350	3·0	1,672,475	2,097,686	25·4
East London	1,695,260	1,720,560	1·5	3,212,518	3,269,064	1·8
Grand Junction	1,070,000	1,150,800	5·7	2,126,300	†2,540,840	19·4
Kent	699,250	780,649	11·6	‡1,665,488	1,957,870	17·6
Lambeth	1,375,195	1,450,000	5·4	§2,404,709	3,218,026	33·8
New River	2,019,958	2,019,958	—	8,474,000	7,817,000	7·8 (a)
Southwark & Vauxhall	1,390,000	1,518,000	9·2	2,356,509	2,279,890	3·0 (a)
West Middlesex	1,154,541	1,155,066	.05	2,828,625	2,951,194	4·3
Totals	10,404,804	10,805,383	3·8	24,736,624	26,131,570	5·6

* See letter from Stock Exchange, quoted *supra*.
† This is the value of £1,120,000, the amount of share capital at the end of September, 1887; and not of £1,130,800, the amount at the end of March, 1888.
‡ This is the value of £688,907, the amount of share capital at the end of 1883; and not of £699,250, the amount at the end of June, 1884.
§ This is the value of £1,325,047, the share capital at the end of September, 1888; and not of £1,375,195, the amount in March, 1884.

Name of Company.	Amount of Loan Capital.		Inc. per Cent.	* Estimated Value of Loan Capital on or about		Inc. per Cent.
	March or June, 1884.	Dec., 1887, or March, 1888.		Dec. 31, 1883.	Dec. 31, 1887.	
	£	£		£	£	
Chelsea	150,100	150.100	—	183,122	192,128	4·9
East London	394,440	491,000	24·6	481,217	643,786	33·8
Grand Junction	265,000	265,000	—	291,300	304,750	4·6
Kent	42,000	42,000	—	42,000	42,000	—
Lambeth	150,000	200,000	33·3	†170,800	226,000	32·3
New River	1,330,000	1,430,000	7·5	‡1,406,012	1,680,250	19·5
Southwark & Vauxhall	432,000	482,000	11·6	510,425	586,419	14·9
West Middlesex	—	99,935	—	—	127,917	—
Totals	2,763,540	3,160,475	14·4	3,084,876	3,803,250	23·3

* See letter from the Stock Exchange, quoted *supra*.
† This is the value of £158,925, the amount of loan capital at the end of September, 1883; and not of £150,000, the amount in March, 1884.
‡ This is the value of £1,271,571, the amount of loan capital at the end of 1883; and not of £1,330,000, the amount in June, 1884.

From the preceding tables it will be seen that, although the value of the share capital of the New River and Southwark and Vauxhall Companies was less at the end of 1887 than at the end of 1883, yet on the whole the rise in the value of the share and loan capital of the Metropolitan Water Companies continues to be greater than the increase in the amount of the capital. The proportion, however, between the rise in value and the increase in amount is not so much in favour of the rise in value as it was in the period to which the previous return related. During the period in question (1872 to 1883), the share capital increased 30 per cent. in amount and 101·1 per cent. in value; while the loan capital increased 18·8 per cent. in amount and 42·3 per cent. in value. In this connection, it is worth while to recall the fact that in the earlier period the dividends of all the Companies rose, by amounts varying from 3s. 5d. to £4 10s. per cent.; while in the later period the dividends of three of the Companies have fallen slightly, and no dividend has risen by more than 1¾ per cent.

GLASGOW CORPORATION WATER SUPPLY.

The Annual Report.

At the last Monthly Meeting of the Glasgow Town Council, the annual report of the Water Commissioners was submitted. This showed that the revenue for the year amounted to £165,400; and from river-supply works, £2514 making with a credit balance from the previous year of £13,478, a total of £181,393. The expenditure, including annuities and interest, amounted to £117,184; and the outlay for river-supply works amounted to £4175—making a total of £121,359, and leaving a balance of £60,034. Of this sum there was carried to sinking fund account £47,821, and to the credit of revenue account for the year 1889-90, £12,205. Mr. Waddel, in the absence of the Convener, moved the approval of the accounts. The figures, he thought, spoke well for themselves, both as regards works and finance. During the current year, they had spent £70,000 upon new works, which would be added to capital account. After the recent visit which the Commissioners paid to the works, they would have to some extent an idea of the extraordinary works going on both at Craigmaddie and at the tunnel and other excavations. Looking at the great extent of work, he thought satisfactory progress was being made. The Engineer whose fame was connected with these works (Mr. La Trobe Bateman) had recently passed away. But he had a monument to his memory in these works that would endure. He had left a legacy behind him that spoke for the progress of engineering, and which did honour to his name. His mantle had fallen on their own Engineer (Mr. J. M. Gale), who was carrying on the works on the same lines; and the Commissioners hoped he would live to see the completion of those works, which would add to his fame and his name, as in the case of his predecessor. The motion was agreed to.

Calverley and Horsforth Gas Company.—The half-yearly report of the Directors of this Company states that the receipts during the half year for gas, coke, residual products, &c., amounted to £3351, and the expenditure on wages, coal, &c., to £1866. The balance available for dividends is £1239. The capital account is put down at £29,674; and the cost of works to date at £33,353.

York Water-Works Company.—The report of the Directors of this Company, to be presented at the half-yearly meeting of shareholders to be held on the 1st prox., shows that there is a satisfactory increase in the revenue from water-rents. The Board recommend a dividend of 5s. per share on the preference shares, being at the rate of 5 per cent. per annum; a dividend of 9s. per share on the ordinary shares, being at the rate of 9 per cent. per annum; and a dividend of 6s. 3d. per share on the new shares 1878 and 1879, being at the rate of £6 5s. per cent. per annum, for the past half year.

NOTES FROM SCOTLAND.

(from our Edinburgh correspondent.)

Edinburgh, *Saturday*.

The chief item of interest to readers of the Journal in my district this week has, of course, been the meeting on Thursday, of the North British Association of Gas Managers at Dunfermline. As it will be thoroughly dealt with in another part of this week's issue, it is unnecessary for me to enter upon either a description or a criticism of the proceedings. I shall only say that everyone was pleased at the successful nature of the meeting, and that, for myself, the only thing I regret about it was the total absence of representatives of both the Edinburgh and the Leith Gas-Works. The gentlemen in charge of these works are able to take their place in any body of gas managers; and I trust their absence on Thursday was owing to circumstances, and not on account of any want of interest in the affairs of the Association. All the other leading Scotch towns were represented; and their representatives took part in the business.

Bailie Archibald, at the last meeting of the Leith Town Council, gave utterance to some sentiments which promoters of electric lighting will doubtless consider, and, in view of Major Marindin's opinion, may have something to say upon. When it was reported to the Council that five notices of application for leave to supply electric light in the burgh had been served upon them, the Bailie stated that it would scarcely do for them to allow companies to obtain a monopoly of any system of lighting, and put the Corporation to the trouble, at some future time, which they had with the gas undertaking, in acquiring them. If electric lighting were to be introduced at all, it would be much better that it should be done by the Council themselves. The subject was sent to the General Committee to consider. There is little doubt the bailie is right, theoretically; and doubtless he would be right practically, if his views could be given effect to. But with Major Marindin to back them up, the electric light companies will have encouragement to fight the Corporations should they resolve to adopt the policy he recommends. Where the Corporations will have the advantage, as I indicated several weeks ago, will be that the applying companies are likely to fall out among themselves. The policy of the two Corporations of Edinburgh and Leith is to get all the public supplies into their own hands. They already have the water and the gas; and in a few years they will have the tramways. These they manage jointly; and I expect they will make a strong effort to keep electric lighting. This would possibly mean that they would put it forward but languidly, lest it should hurt their gas venture. If they wish to keep their hold of electric lighting, they must, I am afraid, make a liberal offer before the Board of Trade, which will require a close co-operation between the two Corporations. This, judging from past experience, is perfectly possible; and if it be accomplished, it will be but another step towards what is already regarded by many as inevitable—the entire municipal union of Edinburgh and Leith.

An action, arising out of an unfortunate incident, has been brought before Lord Trayner, in the Court of Session, by Mrs. Anna Sim or Burnett, of Fraserburgh, and her five children, against Alexander Macgregor, Solicitor, of Lerwick, as trustee of the sequestrated estate of William Cowie, Hotel Keeper, Lerwick, and also against John Byrne, Manager of the Royal Hotel, Lerwick. Decree is asked for £1000 as damages. Mrs. Burnett is the widow of the late Thomas Burnett, a cooper, of Fraserburgh. On June 15, 1888, Burnett lodged in the Royal Hotel. He went to bed on the Saturday night a strong vigorous man, and was found about noon the next day dead in bed, having been suffocated by gas. The gaselier in his bedroom, it is stated on pursuer's behalf, was not sufficiently trapped, nor furnished with proper cords and weights; and the consequence was that gas escaped. In defence it is stated that the gaselier was of proper construction, but that Mr. Burnett must have pulled it down about a foot, thereby destroying the effect of the water trap; and it is maintained that Burnett's death was thus due to his own negligence.

The Directors of the Leven Gas Company have resolved to celebrate the jubilee year of the Company by having an excursion with the shareholders on Loch Lomond next Thursday.

The Markinch Gas Company, sharing in the general prosperity of the gas industry, has this year paid a dividend at the rate of 10 per cent., as compared with 7½ per cent. last year.

The Kirkcaldy and Dysart Water Commissioners have reduced the public water-rate from 2½d. to 1½d. per pound, and the domestic rate from 11d. to 8d. per pound; allowing the charge for water by measure to remain at 6d. per 1000 gallons.

Last Tuesday, the Aberdeen Town Council inspected the water-works; and in the course of the proceedings, Lord Provost Henderson stated that they had storeage in their service reservoirs at Mannofield and Slopefield, two miles from the city, for four days' supply, but that the main storeage reservoir at Invercannie, 22 miles from the city, only contained two days' supply. It would therefore, he said, be necessary in a few years to increase the storeage capacity at Invercannie; and he thought that, looking to the purity of the water, they might consider whether they could not dispense altogether with filter-beds. The works were found to be in good order.

(from our Glasgow correspondent.)

Glasgow, *Saturday*.

The reduction of 2d. per 1000 feet in the price of Glasgow gas, which it was agreed by the Finance Sub-Committee last week to recommend to the General Committee of the Gas Trust was approved of at a meeting of that body held on Thursday; but it has still to come under the consideration of the Town Council for approval or otherwise. The Council will sit as the Corporation Gas Trust on Thursday. Of course, if the reduction is agreed upon, the same will also have to be made by the Partick, Hillhead, and Maryhill Gas Company throughout those suburban burghs and districts to which their gas supply extends.

I am told that the accounts of the Glasgow gas supply undertaking for the past financial year, which ended on the 31st of May, have now been made up; and that, after everything has been provided for, including a very liberal writing-off for depreciation on the "book" value of the works, meters, pipes, and other property of the Trust, and making liberal allowance for the Tradeston works extensions, &c., there will still be an absolute net surplus of upwards of £5000. But this surplus balance has been kept purposely low, in order, I am told, to secure that very little demand, if any, can be made for pecuniary help by the "Common Good," or any other municipal department.

The work of adding a third lift to one of the large gasholders at the Dawsholm Gas-Works, the contract for which is in the hands of Messrs. Clayton, Sons, and Co., of Leeds, has not made nearly the amount of progress that was stipulated for in the specification under which the contract was taken; and the non-completion of the work within the stipulated time has of late caused a considerable amount of anxiety to the Engineer to the Gas Trust (Mr. W. Foulis) and to the Sub-Committee on Works. This matter has lately been made the subject of correspondence between the Town Clerk's office and the contractors; and the latter have

begun to show a keen desire to "hurry up," and have the work done within a very short period after the expiration of the time allowed in the terms of the contract. For a while there was some difficulty caused by leakage of water into the tank belonging to this holder from the adjoining one; but I understand that the difficulty has been overcome.

One of the biggest orders for coal ever given out by any gas-supply undertaking in Scotland was that placed with the Lanemark Coal Company recently by the Coal Contracts Sub-Committee of the Glasgow Gas Trust. I have now learned, on the very best authority, that it was a "line" for 30,000 tons! I am told that a "line" for a similar quantity was placed with the Provanhall Coal Company; that the Monkland Iron and Coal Company received one for 20,000 tons of Tannochside cannel; and that Messrs. Hamilton and M'Culloch, of the Home Farm Colliery, Hamilton, received an order for 26,000 tons of "Bog" coal. The Niddrie Coal Company had an order for 8000 tons of cannel; and there was a "line" for 7000 tons of Broomhouse or Haughhead cannel. The other orders ranged from 6000 tons downwards; and amongst them there were included Haywood Cannel, Allanton, Merryton, Dalziel, Bent, Rawyards, Quarter, and Westburn. Paisley has yet to conclude its coal contracts for 1889-90; the results, however, will doubtless be known in a day or two. Almost all the other towns of any importance in this part of the kingdom have settled their contracts; and it is now possible to indicate generally the state of matters as regards the prices at which they have been closed. So far as Lanarkshire is concerned, the prices of cannel coals have not undergone much change. The prices of shales, however, including those of the Slamannan district of Stirlingshire, on the borders of Lanarkshire, have been advanced. In passing, I may mention that the Aberdeen Coal Contracts Committee have bought a considerable quantity of Ayrshire cannel—including 6000 tons of Muirkirk No. 2, and 4000 tons of Cairntable cannel. Muirkirk and Cairntable are very far South; so that the railway carriage all the way to the "Granite City" will be a considerable addition to the cost of the coal by the time that it is delivered into the works. Two or three good "lines" have also been placed with merchants for Lanarkshire coals.

The Directors of the Partick, Hillhead, and Maryhill Gas Company resolved at a meeting held last Thursday, to recommend to the forthcoming annual meeting of the shareholders that the dividend for the past financial year (ending June 30) should be at the rate of 6 per cent. on the ordinary shares, after providing for the preference dividend of 5½ per cent., writing off £3000 to the depreciation fund, and carrying forward a balance of fully £1000 to next year's account. These bits of news indicate that the concern in question is now in a very healthy condition. I understand that Mr. W. Young, as Consulting Engineer to the Company, and Mr. Levi Monk, the Works Manager, have lately visited the Belfast Gas-Works, for the purpose of inspecting the Claus process of purification, so as to be able to arrive at an opinion as to its suitability for adoption at the Company's works. I am rather inclined to think that the opinion formed by both gentlemen is adverse to its adoption.

At the half-yearly meeting of the Coatbridge Gas Company, Limited, which was held last Tuesday, it was resolved, on the recommendation of the Directors, to reduce the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet. The fact of such a large reduction in price having been made by this Company will have to be pondered over by other gas companies (as also by gas corporations) in towns and districts not very far away.

Business in sulphate of ammonia is reported to be quiet this week. Still there are but few sellers at prices under the nominal quotations, which range from £11 12s. 6d. to £11 15s. per ton as on delivery. All round, gas managers and their immediate superiors are in high hopes at the prospect of further advances in the prices of residual products—tar and ammoniacal liquor. At the meeting of the North British Association of Gas Managers in Dunfermline this week, many confidential whisperings took place regarding the prices at which contracts have already been fixed this season, and those which are being offered, where the letting of the contracts has still to take place. Almost everywhere a penny or so per 100 gallons is being added to the rates at which contracts have been made. As yet there is no news as to the letting of the contract for the residuals at the Dalmarnock works of the Glasgow Gas Trust. The tenders have been received, and have been opened and initialled; but that is all that offerers have yet been permitted to learn on the matter, however anxious they may be about it.

The Glasgow pig-iron market has been very steady during this week; and Scotch warrants have fluctuated in price between 44s. 10d. cash per ton, and 45s. 4d., at which there were sellers yesterday afternoon when the market closed. Hæmatite iron fluctuated in price between 50s. 6d. per ton on Monday and 51s. 1½d. cash buyers at the close yesterday; and during the week the price of Cleveland iron advanced 1s. 1½d. per ton. Generally the market is very firm; and a large business is expected in the immediate future. Prices are higher now than they have been for seven months.

Very little, if any, change has taken place in the local coal trade during the week. Main coal is in request; and furnace, dross, and other kinds are likewise in good demand. Splint coal is quoted at 7s. to 7s. 3d. per ton f.o.b. at Glasgow.

THE WATER SUPPLY OF NORMANTON.—The members of the Normanton Local Board, at their last meeting, had again under consideration the question of obtaining water in bulk from the Wakefield Corporation. The Chairman (Mr. G. Earle) averred in his opening remarks, that the Board were not to blame for the delay which had taken place in regard to this matter, and gave a brief account of the negotiations that had taken place between the Board and the Corporation. A discussion ensued, which concluded in the adoption of the following motion, proposed by Mr. Schofield:—"That the Board offer the Wakefield Corporation the same terms as before—viz., 8d. per 1000 gallons for a minimum of 75,000 up to 100,000 gallons a day, and 7d. for over 100,000 up to 150,000 gallons, delivered in Marshall Hillreservoir; and that the Board pay the Corporation the sum of £100 per annum for the cost of delivery." This is an increase of £50 on the previous offer for delivery; and it was generally believed by the members that the Corporation would assent to these terms.

SETTLEMENT OF THE PUBLIC LIGHTING QUESTION AT MALVERN LINK.—There has been a little dispute at Malvern Link between the Gas Company and the Local Board as to the street lighting. The latter body desired the Company to extend their mains to the new lamps that had been erected by the Board, and which had been put up since the town was last lighted with gas, and were provided with oil-lights; but the Company would not agree to make the extensions. At the meeting of the Board last Wednesday, the following contract with the Company was approved of:—That governor burners should be used in the street lamps; that 4½ cubic feet of gas per hour should be consumed; that seven meters should be placed at different points; that the quantity of gas consumed should be the average of that quantity; that the price should be 4s. 3d. per 1000 cubic feet; and that the Board should, in addition, pay £25 per annum for the lighting, cleaning, and extinguising of the lamps. The Board also agree to pay for the pipes for the extensions; the Company paying the expenses of laying them.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 27.

Sulphate of Ammonia.—The market is generally quiet, although in some instances higher prices are reported. These higher prices are, however, only accorded for high-class sulphate required for some special shipments, for, although £11 18s. 9d. has been paid f.o.b. Hull for best makes, ordinary quality is still offering at £11 17s. 6d. without finding buyers. At Leith sales down to £11 12s. 6d. are stated to have taken place; but good parcels would to-day bring £11 15s.; and a little more would be probably paid for August-September delivery. Locally the quotations are £11 15s. to £11 18s. 9d. as in quality. There is a fair amount of forward inquiry; but consumers' ideas are so low that their limits do not admit of business. On makers' part, there is very little offering for future delivery; producers evidently believing in a maintenance of values. Nitrate is reported to be firmer; but it will be very difficult, in the present position of the market, to induce consumers to pay advanced rates.

LONDON, *July* 27.

Tar Products.—There is a little more business doing; but prices continue miserably low, with the exception of pitch and creosote oil, which are inquired for for forward delivery, and a shade higher price is offered for them. Carbolic acid is scarce; and the figure quoted is nominal, as it is difficult to procure any at the moment at any price—the make both of it, and of all tar products being now at the minimum. Prices: Tar, 23s. to 28s. per ton, according to position. Benzol, 90 per cent., 2s. 6d. per gallon; 50 per cent., 1s. 11d. per gallon. Toluol, 1s. 4d. per gallon. Solvent naphtha, 1s. 4d. per gallon. Crude naphtha (30 per cent.), 11½d. per gallon. Light oil, 3½d. per gallon. Creosote, 2½d. per gallon. Pitch, 21s. to 23s. per ton. Carbolic acid (60's), 3s. 9d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. to £1 per ton. Anthracene (30 per cent.), "A" quality, 1s. 2d. per unit; "B" quality, 11d. per unit.

Ammonia Products.—Considerable shipments of sulphate have been made during the week; and the article is in decidedly better odour than it has been for some time. It is reported that sulphate is giving very much superior results this year where used against nitrate; and it is expected that this will improve the relative value of sulphate for next season. Prices: Gas liquor (5° Twaddel), 7s. 9d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¼d. per lb. Carbonate of ammonia, 3d. to 3½d. per lb. Muriate of ammonia, brown, £18 10s. per ton; white, £23. Sal-ammoniac, £30 to £32 per ton.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 204.)

Issue.	Share	When ex-Dividend.	Dividend on Ords. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	18–19	..	5 10 6
100,000	10	„	7½	Do. 7 p. c.	10	13–14	..	5 7 2
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	109–111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	24–26	..	7 13 10
200,000	5	15 May	7½	Bombay, Limited	5	6¾–7¼	..	5 8 5
40,000	5	„	7½	Do. New	4	5–5½	..	5 9 1
380,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	229–234	..	5 0 5
125,000	„	„	8½	Do. New	100	167–172	..	5 1 9
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	43–45	..	4 13 4
320,000	20	28 Mar.	11½	British	20	45–47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20–22	..	5 0 0
39,000	10	„	8	Do. 7 p. c.	10	12½–14½	..	5 10 4
528,750	10	30 May	10	Buenos Ayres (New) Limited	10	14½–15½	–½	6 9 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	105–108	..	5 11 1
150,000	20	28 Feb.	8	Cagliari, Limited	20	25–27	..	5 18 6
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	267–272	..	5 1 1
180,000	„	„	10½	Do. New do.	100	±13–218	..	4 18 8
180,000	„	28 June	4½	Do. 4½ p. c. Deb. do.	100	122–125	..	3 12 0
557,320	20	14 June	13	Continental Union, Limited	20	46–48	..	5 8 4
242,680	20	„	13	Do. New '69 & '72	14	32½–33½	..	5 8 5
200,000	20	„	10	Do. 7 p. c. Pref.	20	37–39	..	5 2 6
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204–208	..	4 16 2
234,060	10	26 July	13	European, Limited	10	24½–25½*	..	5 1 11
120,000	10	„	13	Do. New.	7½	17–18*	..	5 7 10
354,060	10	„	13	Do. do.	5	12–13*	..	5 0 0
5,468,600	Stck.	14 Feb.	13½†	Gaslight & Coke, A, Ordinary	100	265–269	..	5 2 4
100,000	„	„	4	Do. B, 4 p. c. max.	100	100–105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	257–262	..	3 16 4
80,000	„	„	5	Do. F, 5 p. c. Prf.	100	123–128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182–187	..	4 0 4
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	168–172	+1	4 1 4
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	255–260	..	3 16 11
1,031,150	„	14 June	4	Do. 4 p. c. Deb. Stk.	100	119–122	+1	3 5 7
294,850	„	„	4½	Do. 4½ p. c. do.	100	126–130	..	3 9 8
650,000	„	„	6	Do. 6 p. c. do.	100	171–175	..	3 8 6
8,600,000	Stck.	15 May	10	Imperial Continental	100	206–209	..	4 15 8
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5–5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p.c. Deb.	100	115–117	+2	4 5 6
541,920	20	14 June	6	Monte Video, Limited	20	20–21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	9–9½	..	5 5 3
60,000	5	28 Mar.	7	Ottoman, Limited	5	6½–6¾	..	5 8 8
166,870	10	16 Jan.	4	Pará, Limited	10	5–5½	..	7 5 5
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	103–107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	98–102	..	5 17 8
100,000	10	26 Apr.	10	San Paulo, Limited	10	16½–17½	..	5 14 4
500,000	Stck.	28 Feb.	16½	South Metropolitan, A Stock	100	320–325	..	5 0 0
1,350,000	„	„	19½	Do. B do.	100	243–248	..	4 17 9
141,500	„	„	18½	Do. C do.	100	260–270	..	4 18 1
600,000	„	28 June	5	Do. 5 p. c. Deb. Stk.	100	137–142	..	3 10 5
60,000	5	28 Feb.	11½	Tottenham & Edm'ntn, Orig.	5	11–13	..	8 5
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	270–275	+3	3 9 1
1,720,560	Stck.	11 Apr.	7½	East London, Ordinary	100	208–212	+1	3 10 9
544,440	„	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	140–143	..	3 2 11
700,000	50	14 June	9	Grand Junction	50	127–132	+3	3 8 2
708,000	Stck.	14 Feb.	10½	Kent	100	270–275	–4½	3 16 4
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	258–263	+5	3 8 5
406,200	100	„	7½	Do. 7½ p. c. max.	100	200–208	..	3 13 10
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
500,000	100	14 Feb.	13½	New River, New Shares	100	355–360	..	3 7 4
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	126–129*	+1	3 2 0
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	176–181	+2½	3 6 4
1,126,500	100	„	6	Do. 7½ p. c. do.	100	167–172	+3	3 8 9
155,066	Stck.	14 June	10	West Middlesex	100	267–272	+2	3 13 6

*Ex div.

† Next dividend will be at this rate.

THE NEW RAVENSTHORPE RESERVOIR OF THE NORTHAMPTON CORPORATION.—The Mayor (Mr. J. Barry) and members of the Northampton Corporation recently paid a visit to the reservoir which has been constructed, from the plans of Messrs. T. and C. Hawksley, in the valley between Coton and Ravensthorpe. The bed of the reservoir is ¾ mile in length, by about 3 furlongs in width. The main source of supply is from the Coton Brook, near the present temporary filter-beds from which the town is now supplied; but in addition there are several springs, and there will also be the rainfall from the surrounding extensive watershed. At the Ravensthorpe end, or that nearest the town, there is an embankment some 40 feet in height and 230 feet in width at the base. Throughout the centre of this embankment there is a wall of clay ranging from 12 feet at the base to 6 feet at the top, and strengthened by walls on either side, and the embankment on the water side is faced with large Derby stones. It is computed that, when the reservoir is full, there will be a surface of water covering from 120 to 125 acres; and it is calculated that it will contain about 400 million gallons, and enable a supply to be made to the town daily of 1½ million gallons. Close to the embankment are three large filter-beds, a pure-water tank, a cooling pond, and an engine and boiler house, each of which is most substantially and admirably built; and there are also houses for the accommodation of those who will be employed at the works. The total cost of the undertaking, from its commencement to the completion, including all preliminary proceedings, will, it is estimated, be considerably above £300,000. At the conclusion of the inspection, the assembled company were entertained at luncheon by the Mayor.

WAKEFIELD CORPORATION WATER SUPPLY.—The Wakefield City Accountant (Mr. C. E. Coxon) has issued his abstract of the borough accounts for the financial year ending the 25th of March last. Concerning the Water Department, it is stated that the total receipts amounted to £15,224 (of which £15,163 was from water-rents) as against £12,266 in the previous year, or an increase of income by £2897. Salaries and wages absorbed £870; rates and rents, £1525; miscellaneous expenses, £1964; interest and sinking fund, £8340; and £154 was transferred to interest on new water-works loan fund, making a total of £662 on the year's operations, as against an adverse balance of £2620 at the end of the previous year. Turning to the stock account of the old water-works, a material alteration is seen from the results of the preceding year. The assets now stand at £209,902, as against £211,215 last year, the exact amount of the then liabilities. Now the latter stand at £209,902, including a balance of £14,167, due to the Treasurer on the 25th of March last. Greater interest will, however, attach to the stock account of the new water-works. The items on the side of assets are these: Ringstone reservoir and compensation conduit, expended to date, £48,019; Moss Moor catchwater, £54,563; Ardsley reservoir, £100,349; pipes, &c., £62,096; land and compensation, £47,567; law and valuer's charges, £19,429; engineer's charges, £8000; engine-house, mains, &c., £10,092; Parliamentary expenses, £8052; miscellaneous, £1265—aggregate, £359,435. The items on loan liability are: Stock amount outstanding at date, £130,952; mortgage debentures, do., £231,348—total £362,300. The difference between the two sides of the account is £2864, standing cash in Treasurer's hands.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

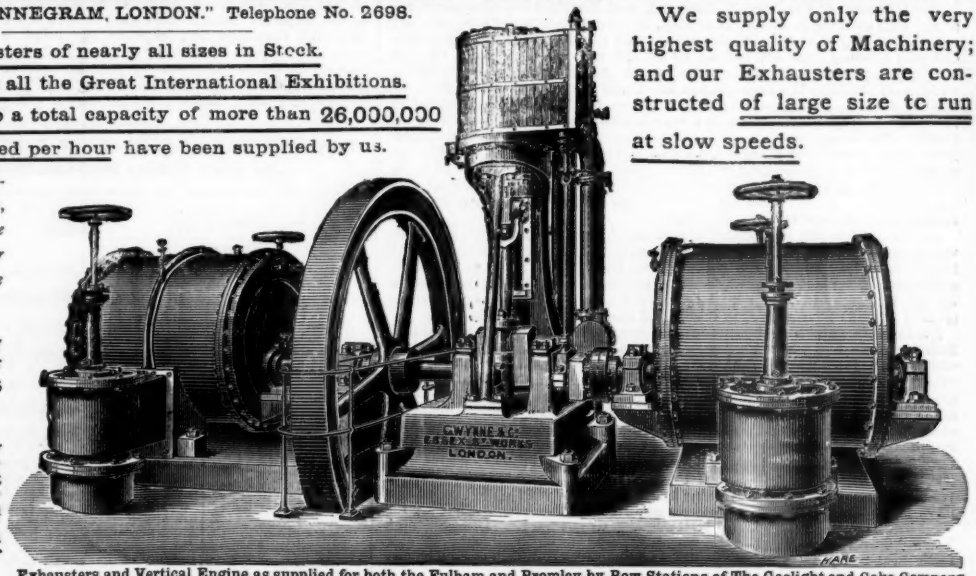
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size tc run at slow speeds.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, No. 54, BERNARD STREET, LEITH, } SCOTLAND.

£20 will be given as a Bonus, by a Young Man (19 years old), to any Manager of small Works finding him a Situation as ASSISTANT.
Advertiser will consider all communications as strictly private and confidential.
Address No. 1728, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas-Meter Repairer. One with a knowledge of Water-Meters preferred.
Address (stating Wages required) T. DUXBURY, Gas-Works, DARWEN.

WANTED, a Working Foreman for a Gas-Works making about 20 million cubic feet per annum. Must have good practical knowledge of Carbonizing, laying Mains, putting in Services, and of the General Routine of a small Works. Sobriety and thoroughly good character indispensable.
Address No. 1731, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TIMMIS & CO., of STOURBRIDGE
Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats.
All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 187 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award. Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

CARBON.

WANTED, 10 to 15 tons of pure Carbon.
State price and quantity delivered on to Rails.
Address No. 1729, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Exhauster in good condition; capable of passing 1 million cubic feet of Gas per day.
Apply, with particulars and price, and stating where the Exhauster can be seen, to No. 1726, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Set of Condensers, with 6-inch Bye-Pass, &c., complete. A TOWER SCRUBBER, 16 feet high, 3 feet diameter, with 6-inch Bye-Pass and Connections complete. In first-class condition.
Apply to Mr. TAYLOR, Hurst Mills Company, Limited, ASHTON-UNDER-LYNE.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*
Highest References and all particulars supplied on application.

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice
Address P. J. DAVIES, 78, Earl's Court Road, Kensington, LONDON.

GAS-WORKS AND CHEMICAL PLANT FOR SALE.

CARBONIZING Plant at Mount Vernon, Glasgow, FOR SALE, consisting of 60 Retorts, with Condensers, Exhausters, and Scrubbers; also Benzol Recovery Plant. All complete and in good order; having only been in use a short time. Makers, Dempster and Sons, Elland.
To be sold by private treaty, in one lot, or separately, to suit purchasers.
Apply to REID BROTHERS, 67, St. Enoch Square, GLASGOW.

FOR SALE—Single Gasholder, 60 feet diameter by 23 feet deep. Capacity, 65,000 cubic feet; fixed complete; in good condition.
Also four PURIFIERS in a line, 14 ft. square by 4 ft. deep, with Centre-Valve and Connections, Wrought-Iron Covers, Lifting Gear, and Crab complete. Makers, Messrs. C. & W. Walker.
Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.
Would erect the above and make practically equal to new.
Inquiries invited for various second-hand Gas Plant—Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

FOR SALE—Two Ammonia Boilers, 10 ft. by 4 ft. fitted with Steam-Coils, and two Apron Saturators and Draining Tank; being a complete Plant for the Manufacture of Sulphate of Ammonia. In good order, and capable of working up 1000 gallons of Liquor daily.

Can be seen in use, and will be sold cheap to effect a clearance for the erection of a larger Plant.

Apply at the Gas-Works, Bromley, Kent.

GEORGE H. OSBORN,
Secretary and Manager.

July 25, 1889.

FOR SALE — One 24-inch Patent Suspended, Self-Balancing CENTRIFUGAL MACHINE, with Column Framing and Driving Gear complete; Basket, with discharge through bottom; Pulley, 4 ft. by 6 in.; and main Driving Belt. Makers, Watson, Laidlaw, and Co.

One FEED PUMP, with Diagonal Slides.
Four CRAB WINCHES.
BEAM and SCALE, with Weights complete.

Apply at 16, DIXON STREET, GLASGOW.

Next Stock and Share Auction, Wednesday, July 31, at 2.30, by

MESSRS. EDWIN FOX and BOUSFIELD, in well-established Undertakings—

DARTFORD GAS COMPANY 116 £10 "B" 7 per Cent. Shares, fully paid; and 200 £10 New Ordinary 7 per Cent. Shares, fully paid. Maximum Dividends are paid.

EPSOM and EWELL GAS COMPANY—68 £25 Ordinary Shares, fully paid. Dividend 8 per Cent.

NORTHFLEET and GREENHITHE GAS COMPANY—£200 3½ per Cent. Preference "B" Stock.

Also in other Companies.

Catalogues may be obtained at the MART; and of Messrs. EDWIN FOX and BOUSFIELD, 99, Gresham Street, BANK, E.C.

TO TAR DISTILLERS AND OTHERS.

THE Gas Department of the Wigan Corporation invite TENDERS for TAR for One or Two years, commencing on the 1st of September, 1889, and terminating on the 31st of August, 1890 and 1891, respectively.

Particulars and forms of tender may be obtained on application to the undersigned.

The highest tender not necessarily accepted.

Tenders, sealed and endorsed "Tar," to be addressed and delivered to R. Darlington, Esq., Town Clerk, on or before the 20th of August next ensuing.

JOS. TIMMINS, Engineer, &c.

Borough Gas-Works, Wigan, July 17, 1889.

LEIGH LOCAL BOARD.

THE Gas Committee of the Leigh Local Board invite TENDERS for the purchase of the surplus TAR, produced at their Gas-Works, for a period of One year from the 1st of September next.

All particulars, with form of tender, may be had from the undersigned.

Sealed tenders, endorsed "Tar," and addressed to Mr. Alderman Thorp, Chairman, to be delivered at the Town Hall, Leigh, on or before Monday, the 19th of August next.

The highest or any tender not necessarily accepted.

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancashire,
July 25, 1889.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Directors of the Wakefield Gaslight Company re prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works, for One year, commencing the 1st of September next.

Estimated production: Tar, 1300 tons; Ammoniacal Liquor, 3500 tons.

The Liquor to be tested by what is known as "Wills's Test."

Tenders, properly endorsed, to be sent in on or before the 3rd of August next.

By order,
JOHN W. WHITAKER,
Secretary and Manager.

Gas Office, July 22, 1889.

TO COAL MERCHANTS.

THE Milton Improvement Commissioners invite TENDERS for the supply and delivery of about 600 tons of GAS COALS, to be supplied at such times, during the year ending Aug. 8, 1890, as may be required.

The Coals must be delivered free of all charges over the Ship's side at the Town Wharf, Milton.

Forms of tender and all necessary information can be obtained on application to the Gas Manager. Applications not on the forms applied will be rejected.

The Commissioners do not bind themselves to accept the lowest or any tender.

Tenders should be sent or delivered to me on or before Aug. 19 next, endorsed "Tender for Coals," and addressed "Chairman, Milton Improvement Commissioners."

WM. PARHAM, Clerk.

Milton-next-Sittingbourne,
July 25, 1889.

TENDERS FOR GAS COAL.

THE Malvern Local Board invite TENDERS for the supply of 1000 tons of BEST WIGAN SCREENED GAS COAL, and 500 tons of BEST SCREENED SILKSTONE GAS COAL, to be delivered and stacked at their Gas-Works, Great Malvern, at such times and in such quantities as may be required, between the following dates:—

Wigan Coal from the 1st of September to the 30th of November, 1889.

Silkstone Coal from the 1st of September to the 31st of October, 1889.

Tenders to be sent to the undersigned, marked "Gas Coal," on or before Monday, the 5th prox.

The Board do not bind themselves to accept the lowest or any Tender.

By order,
WM. LAMBERT,
Clerk to the Board.

Local Board Offices, Malvern,
July 23, 1889.

STRATFORD-UPON-AVON CORPORATION GAS COMMITTEE.

TENDERS FOR GAS COAL.

THE Stratford-upon-Avon Corporation Gas Committee invite TENDERS for the supply of 3000 tons of GAS COAL.

Forms of tender and full particulars can be obtained by applying to

J. S. CRANMER,
Secretary and Manager.

July, 1889.

HAVERHILL LOCAL BOARD.
(GAS DEPARTMENT.)

AMMONIACAL LIQUOR.

THE Haverhill Local Board invite TENDERS for the purchase of about 4000 gallons of AMMONIACAL LIQUOR now stored at the Gas-Works.

Particulars and Conditions may be known on application to the undersigned, to whom sealed tenders, endorsed "Tender for Ammoniacal Liquor," must be delivered by the 12th of August next.

J. KEMP, Manager.

Haverhill, Suffolk, July 25, 1889.

PADIHAM AND HAPTON LOCAL BOARD.

TO IRONFOUNDERS.

THE Local Board of Padiham and Hapton invite TENDERS for the supply of 500 yards of 12-inch WATER-PIPES.

Form of tender and specifications may be obtained on application to the Water Engineer, Mr. Gregson, Padiham.

Sealed tenders, endorsed "Tender for Pipes," must be delivered to me, the undersigned, on or before the 5th day of August.

By order,
J. R. SMITH, Clerk.

Local Board Offices, Padiham,
July 24, 1889.

BOROUGH OF DONCASTER.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the purchase of an old GASHOLDER, 60 ft. by 20 ft., with the cast-iron Lattice Columns (five in number), Pulleys, Chains, and Balance-Weights complete. The purchaser to take out the Holder, and clear all away at his own Risk and Cost.

To view, and any other information, apply to Mr. R. Bridge, the Engineer of the Works.

Tenders must be sent to the undersigned, sealed, and endorsed "Old Gasholder," not later than Wednesday, Aug. 7, 1889.

By order of the Committee, who do not bind themselves to accept the highest or any tender.

H. WAINWRIGHT, Chairman.

Gas-Works, Doncaster, July 27, 1889.

EXTENSION OF TIME.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of SULPHURIC ACID required for their Gas-Works during the next Twelve months.

The quantity will be about 1100 tons.

Further particulars may be obtained on application to the Engineer, Gas-Works, Bloom Street.

Sealed tenders, endorsed "Tender for Acid," addressed to the Chairman of the Gas Committee, to be delivered at my Office not later than Five p.m. on Thursday, the 8th of August next.

By order,
SAML. BROWN, Town Clerk.

Town Hall, Salford, July 29, 1889.

CORPORATION OF LEICESTER.

AYLESTONE ROAD WORKS.
NEW SHEDS.
SECTION No. 2.—CONTRACT No. 17.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply and erection of CAST and WROUGHT IRONWORK required for new SHEDS.

Drawings may be seen, and specification and form of tender obtained, upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon the receipt of a *bonâ fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Sheds," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Aug. 10 prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
July 24, 1889.

MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the Purchase and Removal of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of Five or Seven Years, commencing at Noon on the 30th day of June, 1890.

The Committee do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 8th day of August prox.

Forms of tender and further particulars may be obtained on application, in writing only, to Mr. Charles Nickson, Superintendent of the Department. A deposit of One Guinea (which will be returned on receipt of the tender) must accompany each application for a tender form.

By order of the Gas Committee,
JOSEPH HERON, Town Clerk.

Town Hall, Manchester, July 5, 1889.

TAR AND LIQUOR.

THE Eccleshill and Bolton Gas Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR to be produced at their Works, together or separately, for Twelve months, from the 1st of September next. Can be delivered in Contractor's Tanks at the Station (G.N.R.).

Coal carbonized per annum, about 1800 tons.

Tenders, sealed and endorsed, must reach me not later than Thursday, the 1st of August.

J. MELLOR, Secretary.

Eccleshill, near Bradford, July 17, 1889.

TO COAL OWNERS.

THE Directors of The Gaslight and Coke Company are prepared to receive TENDERS for a supply of COAL, for One, or Two, or Three years, from the 1st of July, 1890, in accordance with Specifications to be obtained at this Office.

The Company's annual consumption of Coal is about 1,750,000 tons; and the principal Works of the Company are accessible by Railway, in direct communication with all the Inland Coal-Fields, as well as by Screw Colliers from the Northern Coal Fields.

Tenders are to be sent in before Noon on Tuesday, the 13th of August next, addressed to me, and endorsed "Coal Tender."

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., July 20, 1889.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that a Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office on Friday, the 9th day of August next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending on the 30th day of June last.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., July 24, 1889.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Guildhall Tavern, Gresham Street, in the City of London, on Friday, the 30th day of August next, at Half-past Twelve o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The Transfer Books will be closed from the 17th to the 30th of August, both inclusive.

By order of the Board,
ALFRED LASS, Secretary.

Offices: 30, Gracechurch Street, London,
July 19, 1889.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

NORTH OF IRELAND
ASSOCIATION of GAS MANAGERS
THE
ANNUAL MEETING
Of this Association
WILL BE HELD IN THE
MARKET HOUSE, DUNDALK,
ON TUESDAY, AUG. 13, 1889.

The Chair to be taken at 1.30 p.m. by the President, Mr. W. B. FEATHERSTONE.

The Members will Dine together in the QUEEN'S ARMS HOTEL, at Four p.m. Tickets, 4s. each, to be had from the Secretary. *It is important* that Dinner Tickets should be secured *not later than the 10th of August.*

The cordial co-operation of all Irish Gas Managers is earnestly requested by the Committee; and the Secretary will be glad to receive the names of any gentlemen intending to be present or to join the Association.

JAMES WHIMSTER,
Hon. Secretary.

Gas-Works, Armagh, July 20, 1889.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected, including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This Process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

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CAN BE HAD OF THE PUBLISHER.

Price 2s. each.

Now Ready, Fcap. 4to, Cloth, Gilt Lettered, with numerous Illustrations, price 7s. 6d., post free.

PRACTICAL PHOTOMETRY:

A GUIDE TO THE STUDY OF THE

Measurement of Light.

By WILLIAM JOSEPH DIBDIN, F.I.C., F.C.S.,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

CHEMIST AND SUPERINTENDING GAS EXAMINER TO THE LONDON COUNTY COUNCIL.

The aim of the Author has been to give a comprehensive account of the various methods of Photometry in daily use, and to make the book thoroughly practical by indicating the many precautions necessary for ensuring accurate results in photometrical work. The volume contains chapters on the History and Principles of Photometry; Horizontal, Radial, and Jet Photometers; Standards of Light; the Proposed Substitute for Candles; the Auxiliary Apparatus required in Testing Gas; the Examination and Adjustment of a Gas-Testing Photometer; and Colour and Stellar Photometry; together with an Appendix comprising the Notification of the Metropolitan Gas Referees, Tables for the Correction of Volume of Gas and Observations of Candles, and other matter useful to Photometrists.

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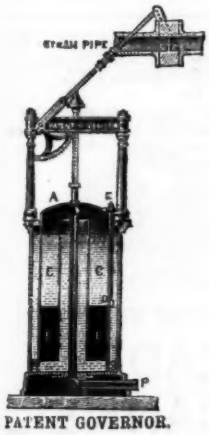

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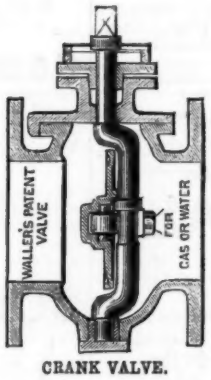

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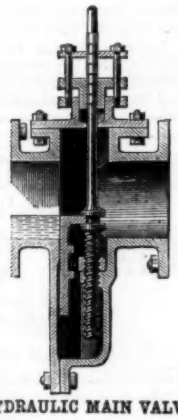
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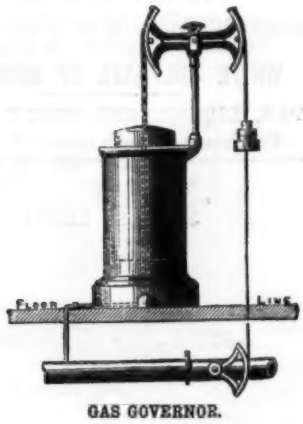
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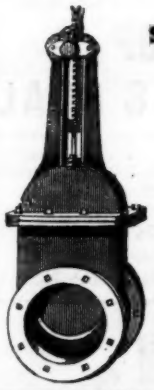
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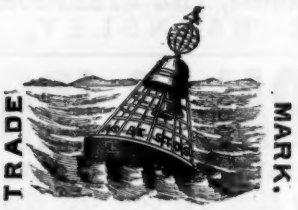

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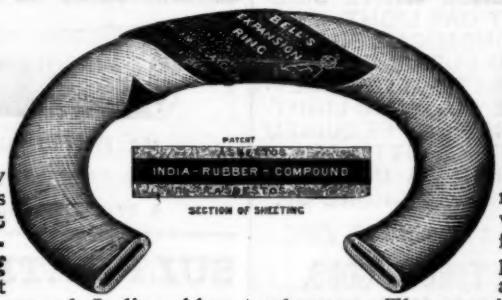

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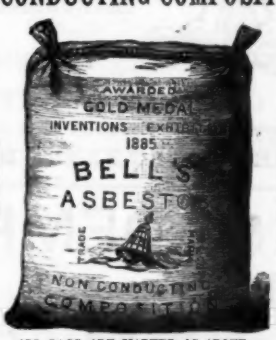

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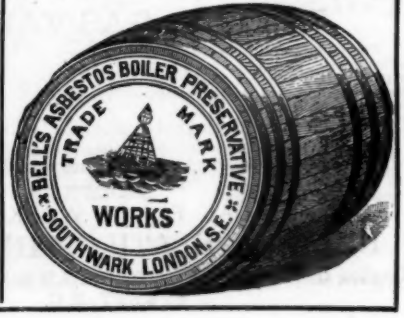

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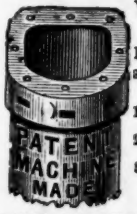

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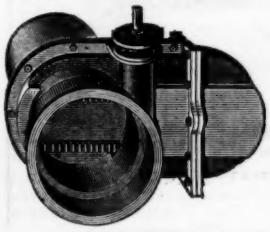

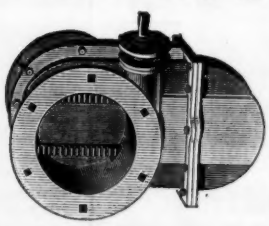

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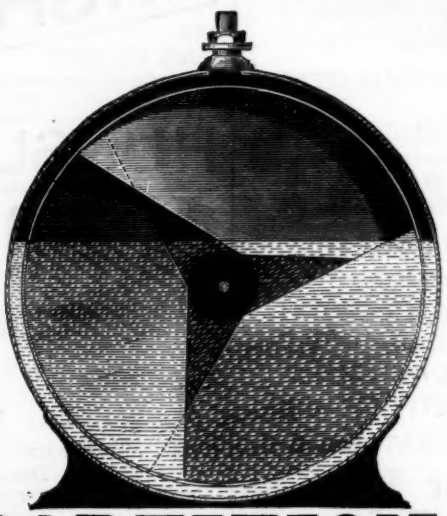

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